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BUCHANAN (L. L.). **Notes on the generic Synonomy of** *Collabismodes cubae* **Boh. (Coleoptera : Curculionidae).**—*Bull. Brooklyn ent. Soc.* **30** no. 3 pp. 125–126. Brooklyn, N.Y., June 1935.

The author discusses the species of *Faustinus* (of which *Euxenus* and *Euxenodes* are synonyms) and of *Collabismodes*, which he thinks it is most convenient to treat as distinct genera. He considers that the species described as *Cryptorrhynchus cubae*, Boh. [*cf. R.A.E.*, A **22** 601] is best placed in *Collabismodes* [*cf.* **23** 277].

M. (Fréd.). **Le Fléau acridien au Zoulouland et au Natal.**—*Matér. Etude Calam.* no. 34 pp. 148–152. Geneva, 1935.

In 1934 the invasion in South Africa of the brown locust [*Locustana pardalina*, Wlk.] and the red locust [*Nomadacris septemfasciata*, Serv.] assumed catastrophic proportions. In Natal and Zululand most serious damage was done to sugar-cane, the value of annual sugar production in Zululand decreasing from £2,000,000 to £1,000,000. In the Magut district 40,000 acres of pasture were destroyed, and it is generally feared that the loss of crops, and particularly of maize may lead to a famine among the natives. Flame-throwers, poisoned baits and dusting of flying swarms with sodium arsenite from aeroplanes were employed for control, and these in Natal and Zululand had cost £500,000 up to the end of June 1934. More than 3,000 tons of sodium arsenite were distributed during the first seven months of that year.

NICHOL (A. A.). **A Study of the Fig Beetle,** *Cotinis texana* **Casey.**—*Tech. Bull. Ariz. agric. Exp. Sta.* no. 55 pp. 155–198, 7 pls., 7 figs., 24 refs. Tucson, Ariz., 15th January 1935. [Recd. July 1935.]

In Arizona, *Cotinis texana*, Casey, the status and distribution of which is discussed, severely injures or totally destroys figs, peaches and grapes from the end of July to the end of September. It is most harmful at altitudes between 1,000 and 3,500 ft., but it occasionally attacks apples and pears at elevations up to 5,000 ft. Temperature limits its distribution to altitudes of 500–5,000 ft. Irrigation has increased its numbers many thousandfold by extending the amount of suitable breeding ground. A total of 99 per cent. of the population is produced from corrals and stack bottoms. All stages of the insect, which has only one generation a year, are described. In the field eggs are found 2½–5 ins. below the surface, each in a small cell made by the ovipositor. At soil temperatures of 80–85°F. the incubation period is 7–8 days and with the optimum moisture content of 10–20 per cent. all the eggs hatch. In the laboratory the average number of eggs laid by one female was 107, the egg-masses comprising from 6 to 60 eggs. The length of the oviposition period varied from 4 to 41 days, but was lengthened when the moisture content of the soil was above 20 per cent. A moisture content of 30 per cent. during one-half or more of the incubation period is fatal to the eggs. Eggs are laid from the first week in August to the end of October, with the peak of oviposition in the first half of September. The best conditions for incubation are a sandy clay soil of medium organic content, a soil temperature range of 80–90°F. and a moisture content range of 15–20 per cent. Newly hatched larvae are found in the field, usually just beneath the organic litter, from 15th August to 10th November. Only the larvae that hatched in late autumn

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showed a tendency to burrow more than 2–3 ins. in the soil. Second instar larvae were found from the end of August to mid-January in permanent tunnels 4–12 ins. deep. A hard or wet soil keeps them nearer the surface. The larvae from the earlier laid eggs moult for the third time by 20th September. The grubs feed only under a cover of litter. In winter they feed during the warmest part of the day, but in August and September they mostly feed by night. The faecal pellets may cover the ground under the litter to a depth of almost 1 inch. The tunnels extend usually one or two feet beneath the surface. At the bottom there is an enlarged space in which the grub rests between feeding periods. In one locality 101 third-instar larvae were taken on 8th October from an area of 3 ft. square. Grubs that reach the third instar between January and March often construct temporary earthen cases in which they rest until April or May, and then return to the surface to feed, and make a new tunnel. These individuals pupate at the end of May. Grubs from eggs laid late in the season continue to be active throughout the winter and pupate in June. Third instar larvae can be found throughout the year except in July and August. Larvae found in June are from eggs laid at the end of October. Experiments to determine the larval growth in media of different organic concentrations indicate that while dead organic matter is their sole food, a certain amount of inert material seems to be essential.

The pupal case is constructed 2–5 ins. below the soil surface, often in the old tunnel, which is filled with soil above and below the pupal chamber. In the field the prepupal period lasts about 10 days, and metamorphosis is usually complete by mid-June. The first summer rain that carries moisture to the pupal cases results in emergence and a general exodus from the soil. Irrigation has the same effect. In years of summer drought, infestation is light because the adults cannot dig their way out of the dry hard ground. If the rains do not begin by 15th July, a periodic stimulus forces them to attempt to get out, and in such years numerous dead adults can be found about an inch below the hard soil of the surface. If spring temperatures are unusually low, general emergence does not occur after the first rainfall, but adults will appear in 2 or more batches, each one occurring within 12 hours after at least 0·25 in. of rain has fallen.

Newly emerged beetles fly to the nearest peach or fig tree, where they attack fermenting or very ripe fruit. The odour and excrement of both sexes ruin every piece of fruit they visit. Feeding takes place all day, but mostly between 10 a.m. and dusk. The beetles rest during the night either on the fruit or in nearby trees. Very little fruit that ripens in late midsummer and early autumn can be harvested. In one locality 83 beetles were observed feeding on one bunch of grapes. Damaged apples, pears and especially watermelons, cactus fruits (*Opuntia* spp.) and late summer sweet maize that has been visited by birds or *Heliothis obsoleta*, F., are also attacked. The high sugar content of the fruit diet is often balanced, particularly in the breeding season, by eating the concentrated proteins of flower pollens of several plants. Pairing, which takes place in adjacent trees, occurs from 10–14 days after emergence. Adults were found in the field until 5th November. In the field old lucerne stack bottoms are preferred for oviposition and then manure piles, and straw and other haystack bottoms. Laboratory tests with various types of soil gave comparable results.

The fungus, *Metarrhizium anisopliae*, which mainly infests third instar larvae, is most abundant in spring and destroys large numbers of them in years when the rainfall is heavy. Infested larvae are chalk-white and brittle and their body cavities are quite filled by the fungus. *Rhizoglyphus phylloxerae*, Riley, which is confined to lucerne stack bottoms, is frequently found on the larvae and occasionally on females that have been ovipositing. It may, however, only attack dead individuals, although when 10 infested larvae were placed in a cage with 26 healthy ones, 20 died and only 3 reached the adult stage.

Effective control can be obtained by thoroughly cleaning corrals, manure piles and stack bottoms between February and April, and removing the manure to the fields or into compost pits protected from the surviving adults. The exposed ground becomes dry and hard during May and June, and imprisons the adults. Flooding the corrals for 48 hours at the end of August and again in September will destroy most of the eggs and young larvae. Continued and heavy applications of water are necessary to kill the second and third instar larvae. Of various poisons applied to the tunnel openings, carbon bisulphide (½ teaspoonful to each hole) gave over 90 per cent. control. No practical way of controlling the adult has yet been found. Nicotine sprays were not effective in strengths low enough to avoid injury to the fruit and leaves. A proprietary pyrethrum compound (1 : 15), which gave 100 per cent. control in the laboratory in 72 hours, produced 85 per cent. control in the field but was too costly for general use. In experiments with baits, such materials as grape juice and sour milk only served to increase the food supply.

RISBEC (J.). **Le cocotier en Nouvelle-Calédonie.**—*Agron. colon.* **23** nos. 199–200 pp. 1–13, 47–53, 8 figs., 1 ref. Paris, July–August 1934.

The author discusses fully the soil and climatic conditions favourable to the coconut and the lack of planting method in New Caledonia. Notes are given on the bionomics and control of *Brontispa froggatti*, Sharp, *Diocalandra* (*Calandra*) *taitensis*, Guér., and *Tirathaba rufivena*, Wlk. The leaves of the palms attacked by *B. froggatti* assume a grey tint. *Plesispa cocotis*, Maulik [*cf. R.A.E.*, A **22** 48], has similar habits to *B. froggatti*, but does less damage. *Agonoxena* sp. [*cf.* **19** 734] causes considerable damage, mostly along the east coast. A species of *Aspidiotus*, which is widely distributed in the Island, is controlled by natural enemies.

RISBEC (J.). **Note préliminaire sur les principaux parasites du cocotier aux Nouvelles-Hébrides.**—*Ann. Soc. ent. Fr.* **104** no. 2 pp. 159–173. Paris, 30th June 1935.

An account is given of coconut pests in the New Hebrides. *Batrachedra arenosella*, Wlk., only attacks the male flowers of the coconut, [*cf. R.A.E.*, A **12** 298]. A Braconid, a description of which is given, was reared from its larvae. *Tirathaba trichogramma*, Meyr., and *T. rufivena*, Wlk., attack the male flower or isolated nuts. The inflorescences are frequently infested by large numbers of larvae. The heart is very rarely attacked. *Promecotheca opacicollis*, Gestro, is only responsible for about one-third of the damage attributed to it. The foliage of infested trees turn greyish, a symptom precisely similar to that

exhibited by palms attacked by the fungus *Pestallozia palmarum*. The egg stage lasts 13 days. The larval stage, comprising 4 instars, extends over about 25 days and the pupal 10 days. About 40 per cent. of the eggs are destroyed by *Oligosita utilis*, Kow. (*Chaetostricha cratitia*, Wtst.) [*cf.* **21** 360], which lays about 4 of its eggs in a single one of the host. *Closterocerus splendens*, Kowalski, parasitises about 6 per cent. of the larvae. *Brontispa froggatti*, Sharp, which attacks mainly young and unhealthy trees, has an egg stage lasting about 6 days. The larva passes through 4 or 5 instars and matures in about 32 days. The pupal period varies from 4 to 7 days. As a result of observations on 6 males and 6 females it is concluded that the adults live for about 4 months and that the females lay about 100 eggs each. *B. froggatti* is attacked by an earwig, *Chelisoches morio*, F., which preys on the larvae [*cf.* **22** 63]. *Diocalandra* (*Calandra*) *taitensis*, Guér., does most damage to the coconut palm. It attacks every part of the trunk, sometimes even attacking the heart ; more often, the attack is localised in the base of the trunk. The wood becomes a mass of frass, and the roots leading from the infested part are killed. The infested part should be cut away and destroyed and the cut surfaces should be tarred. The base of the tree, which is laid bare by infestation, should be earthed up. All stages of another Curculionid (? *Eumycterus* sp.) are described. The female lays an egg in the distal extremity of the stamen. The larval stage lasts about 20 days, and the pupal stage almost 10 days. This species attacks only the male flowers. *Xylotrupes gideon*, L. (*nimrod*, Voet.) does little damage to the coconut palm, and *Oryctes* sp., though numerous is of no great importance.

SUBRAMANIAM (T. V.). **How to free stored Grain from Insect attack.**—*Mysore agric. Cal. 1935*, p. 21. Bangalore, 1935.

This is a note on the protection and fumigation of stored grains against insects. A half-inch layer of fine sand or powdered bark of *Mundulea* [*suberosa*] laid on top of pulses in the receptacles prevents infestation by Bruchids [*cf. R.A.E.*, A **22** 594, etc.]. For fumigation against grain weevils, rice moths, etc., 4 lb. carbon bisulphide per 1,000 cu. ft. in air-tight containers gives good results. If the grain is well aired immediately after fumigation, its germination is not affected.

BARNES (A. C.). **Another Wasp to control Insect Pests has been successfully introduced in Jamaica.**—*J. Jamaica agric. Soc.* **39** no. 5 p. 335. Kingston, May 1935.

The parasite, *Aphytis* (*Aphelinus*) *diaspidis*, How., was introduced into Jamaica in 1934 against Coccids, including *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., infesting *Citrus*, and *Aulacaspis pentagona*, Targ., a pest of papaya, cotton, mulberry, etc. It has become established at the place where it was liberated. A similar parasite [*Eretmocerus serius*, Silv., *cf. R.A.E.*, A **22** 66] was successfully introduced against blackfly [*Aleurocanthus woglumi*, Ashby].

VANDEL (A.). **Relations entre le sexe des Hyménoptères parasites et la taille de leurs hôtes.**—*Bull. Soc. ent. Fr.* **40** no. 9 pp. 136–137, 10 refs. Paris, 1935.

The author, while agreeing with Seyrig's confirmation of Shevuirev's statement [*R.A.E.*, A **23** 352], contends that even if his hypothesis is

true for the genus *Pimpla*, it cannot be applied to Hymenoptera generally, as experiments have proved that the relation between the sex of the parasite and its host is not necessarily connected with the attraction of a definite species among the range of possible hosts, but is determined solely by the size of the host. This has been shown in observations on parasites whose hosts belong to the same species but are of different sizes [*cf.* B **21** 66]. He concludes that the process behind this proved relationship is so far not known.

HALLER (M. H.), BEAUMONT (J. H.), MURRAY (C. W.) & CASSIL (C. C.). **Lead Residues and their Removal as influenced by Spray Programs.** —*Proc. Amer. Soc. hort. Sci.* pp. 179–182, 1 ref. College Park, Md, 1934. [Recd. July 1935.]

Spray and washing investigations were undertaken in the Shenandoah-Cumberland Valley in 1934 on 4 varieties of apples to determine to what extent certain modifications of the spray programme would influence the amount of residue on the fruit at harvest or the difficulty of removing it. Results show that the addition of fish oil or mineral oil to the first two lead arsenate cover sprays did not influence the amount or removal of residue at harvest. The addition of fish oil, calcium caseinate spreader or, particularly, mineral oil to the late cover sprays, increased the residue. The difficulty of removing the excessive residue was greatly increased by the addition of mineral oil to the late cover sprays but was not appreciably influenced by the addition of fish oil and calcium caseinate. When seven cover sprays were given, the residue was greater and more difficult to remove than when only five were applied. Exposing the fruit for one minute to a washing solution of 0·5 per cent. hydrochloric acid at room temperature reduced the residue on some apples to within the tolerance, but if mineral oil had been used in the late cover sprays, it was necessary to increase the concentration to 1·5 per cent. For some varieties a solution of 1·5 per cent. hydrochloric acid at 100°F. was necessary, but even this treatment failed if they had received seven cover sprays containing mineral oil. The addition of Vatsol to the washing solution reduced the residue on these apples to below the tolerance.

DAVIS (A. C.) & YOUNG (H. D.). **An Improved Sulphur Burner for Mushroom-House Fumigation.**—*E— 332*, 2 pp. mimeograph, 2 pls. Washington, D.C., U.S. Dep. Agric., Bur. Ent., January 1935. [Received July 1935.]

A detailed description is given of this burner, which consists of a rectangular box 2 ft. square and 3 ft. long. At each end, a cone 18 ins. long terminates in an open pipe. Within the box, on sliding supports, are 3 trays capable of holding 15 lb. of sulphur. Preliminary tests showed that the sulphur in the middle tray burnt faster than that in the others. To rectify this, baffles were inserted in the intake funnel, thus ensuring even burning and distribution by diverting part of the air current to the top and bottom trays. A fan of the centrifugal type, directly connected to an electric motor, delivers 150 cu. ft. of air per minute through the outlet. When in use, it is advisable to extend the outlet by means of several extra lengths of stovepipe, so that the delivery of gas will be along the floor in the centre alleyway, thus giving better distribution of gas and preventing any flame from penetrating

into the house. The maximum dose is 32 lb. flowers of sulphur for a house of 16,000 ft., but in empty houses 20 lb. have given excellent results.

JACKSON (D. J.). **Giant Cells in Insects parasitised by Hymenopterous Larvae.**—*Nature* **135** no. 3425 pp. 1040–1041, 11 refs. London, June 1935.

The giant cells present in Aphids parasitised by Hymenoptera were considered by A. Paillot [*cf. R.A.E.*, A **23** 106] to originate from the sexual cells of the host. But giant cells in *Sitona lineata*, L., parsitised by *Dinocampus rutilus*, Nees, have been shown to be the hypertrophied cells of the embryonic membrane of the parasite egg [*cf.* **16** 621]. Instances are given from the literature of the presence of these cells in parasitised larvae of various insects.

BRITTON (W. E.) & FRIEND (R. B.). **Insect Pests of Elms in Connecticut.**—*Bull. Conn. agric. Exp. Sta.* no. 369 pp. 265–307, 39 figs. New Haven, Conn., April 1935.

Brief notes are given on the bionomics and control of the principal insect pests of elms in Connecticut and certain other common but less harmful insects that occur on elms. A key contains about 40 insects, arranged according to the way in which they damage the trees. Formulae for insecticides are included.

BRITTON (W. E.). **Connecticut State Entomologist, Thirty-Fourth Report 1934.**—*Bull. Conn. agric. Exp. Sta.* no. 368 pp. 147–262 & xi–xvi, 21 figs., many refs. New Haven, Conn., March 1935. [Recd. July 1935.]

An annotated list (pp. 154–169) is given by W. E. Britton of a number of insect pests occurring in Connecticut during 1934. Britton and J. T. Ashworth record work done in the control of the gipsy moth [*Porthetria dispar*, L.] (pp. 188–197). In material collected from a locality where little control work has been done for several years, 9·84 per cent. of the eggs had been parasitised by *Anastatus disparis*, Ruschka, and 26 per cent. of the larvae by *Compsilura concinnata*, Mg., respectively. From 35 female pupae of the moth three larvae of *Sturmia scutellata*, R.-D., were obtained. Of the remains of 206 pupae, 11·16 per cent. showed evidence of having been destroyed by *Calosoma sycophanta*, L. Britton, M. P. Zappe, J. P. Johnson and N. Turner (pp. 198–206) report on measures for the disposal of stubble and weeds enforced against the European corn borer [*Pyrausta nubilalis*, Hb.] in 1934 and on surveys of its incidence on early and late sweet maize, and the degree of infestation by first and second brood larvae. Many fields had over 1,000 borers to 100 maize stalks, and for the most part infestation was heavier than it had been in 1933. The weed survey showed that the most heavily infested weeds were in the maize fields. In an account of work against the Japanese beetle [*Popillia japonica*, Newm.] (pp. 206–208), J. P. Johnson states that the peak of infestation

was about 10–14 days earlier than usual, the beetles being very numerous during the third and fourth weeks of July. Very few beetles were found after the first week in August except in some small infestations where they were present until 1st September.

In apple spraying experiments by M. P. Zappe and E. M. Stoddard (pp. 210–212), 4–6 applications of 5 lb. dry flotation sulphur and 3 lb. lead arsenate in 100 U.S. gals. water [*cf. R.A.E.*, A **22** 596] gave the best control of curculio [*Conotrachelus nenuphar*, Hbst.] and also of apple scab. Britton (pp. 213–220) recommends the addition of 1 U.S. pt. of a 40 per cent. nicotine solution to 100 gals. lead arsenate spray against *Alsophila pometaria*, Harr. (fall canker worm) and *Palaeacrita vernata*, Peck (spring canker worm), which were very abundant in 1934 on fruit and other deciduous trees. One application should be made in early May and another later if the trees become reinfested. Certain oil sprays containing 6–8 per cent. oil, and also lime-sulphur and nicotine sulphate applied to the dormant trees will kill 80 per cent. or more of eggs that are well soaked. Banding the trees with an adhesive is a good supplementary measure [*cf.* **13** 25]. The bionomics and distribution of *Cryptococcus fagi*, Bär. (beech scale) [*cf.* **22** 497, etc.], which is recorded for the first time from Connecticut, are briefly discussed by Britton (pp. 220–224). Lime-sulphur (7 U.S. gals or 17 lb. to 100 U.S. gals. water) has given satisfactory control. Oil sprays are also effective, but beech is rather susceptible to oil injury. In experiments carried out by D. C. Elliott (pp. 224–231) with *Anasa tristis*, DeG., the bionomics, distribution and food-plants of which are briefly described, the average length of the development period was 44·3 days, and there was only one generation a year. All kinds of cucurbits are attacked, but it was found that squash and pumpkin are preferred, and young nymphs did not survive on cucumber, citron or melon. The greatest number of eggs was deposited in July. Parasitism by the first generation of *Trichopoda pennipes*, F., does not prevent the bugs from laying many of their eggs, but parasitism by the second generation reduces the number that survive the winter. A spray of ½ U.S. pt. kerosene extract of pyrethrum (containing 2·15 per cent. pyrethrins) emulsified with 1 U.S. pt. potash soap (containing 40 per cent. soap) or 1½ lb. laundry soap in 50 U.S. gals. water, applied 4 times at 10-day intervals from the time when the nymphs began to hatch gave the most satisfactory results. In the laboratory the percentage kill varied from 100 per cent. of the first instar to 43 per cent. of the fifth, and in the field the variation was from 96·4 to 39·7 per cent.

P. Garman and J. C. Schread (pp. 231–234) reporting on work in the biological control of the oriental fruit moth [*Cydia molesta*, Busck] state that about 11 million individuals of *Trichogramma* sp., 24,000 of *Macrocentrus ancylivorus*, Rohw., 3,000 of *Perisierola angulata*, Mues., and 900 of *Ascogaster quadridentata*, Wesm., as well as a few other parasites, were liberated. The increase in the numbers of *M. ancylivorus*, of which 41,000 individuals were reared [*cf.* **22** 317], was due to improved methods of breeding. Recoveries of parasites liberated in 1933 showed that the total average parasitism by this parasite was 32·27 per cent., but in July in some orchards it was as high as 91 per cent. *Glypta rufiscutellaris*, Cress., was next in importance, with an average of 9·16 per cent., and in some localities was the only parasite of any value. Garman (pp. 235–236) reports on the results of experiments with substitutes for lead arsenate in sprays against pests of apple. When zinc sulphate was added to calcium arsenate to prevent injury to

the foliage, 19·5 per cent. of the fruit was severely russeted. In two sets of experiments synthetic cryolite (4 lb.) combined with lime (4 lb.) and flotation sulphur (4 lb.) in 100 U.S. gals. water was not as effective against plum curculio [*Conotrachelus nenuphar*] and codling moth[*Cydia pomonella*, L.] as in 1933. The foliage was not scorched, but the control was not so good as with lead arsenate. The cryolite spray gave the most promising results against apple maggot [*Rhagoletis pomonella*, Walsh]. In experiments by Garman (pp. 236–237) with zinc sulphate to prevent the scorching of peach foliage by lead arsenate, trees sprayed on 1st and 14th June began to show evidence of scorching by 1st July. Sprays of 14 combinations of materials were then applied and counts made on 7th September of leaf scars and the remaining leaves on new growth. The best sprays containing lead arsenate (3 lb. in 100 U.S. gals. water) were 4 lb. zinc sulphate, 4 lb. lime and 4 lb. dry flotation sulphur ; and 4 lb. zinc sulphate, 4 lb. lime, 2 lb. bentonite, and 1 lb. glue. These gave 5·8 and 6·1 per cent. leaf fall respectively. Only the plots sprayed with barium fluosilicate and cryolite gave results equal to that of the unsprayed plots. Increasing the amount of lime in sprays containing lead arsenate produced a beneficial effect. It is advisable to add a wettable sulphur to zinc sulphate when using it with lead arsenate to prevent leaf scorching. The use of lead arsenate sprays on peaches is recommended only against curculio, and the formula should include wettable sulphur and at least 8 lb. hydrated lime.

In tests by Garman (pp. 238–239) on the toxicity of anabasine and nicotine in sprays against *Aphis rumicis*, L., on nasturtium leaves under controlled conditions, anabasine was superior in every case. It gave as high a kill as nicotine at 3 or 4 times the strength. Nicotine and anabasine sulphates (1 : 800) in tests by Garman (pp. 239–241) gave efficient control of white apple leafhopper [*Typhlocyba pomaria*, McAtee] in field tests without the addition of soap. Pyrethrum was not so efficient. The supposed liberation of nicotine by the soap is a disadvantage, as part of the insecticidal action is residual.

N. Turner, J. F. Townsend and M. P. Zappe (pp. 241–245) record damage done to 24 buildings in 1934 by the eastern subterranean termite, *Reticulitermes flavipes*, Kollar ; and Turner (pp. 245-247) deals with work on pests of vegetables. The results of the effect of spacing of bean plants on injury by the Mexican bean beetle, *Epilachna corrupta*, Muls., are given [*cf.* **23** 319]. Three applications of a derris dust containing 0·4 per cent. rotenone, or pyrethrum dust containing 25 per cent. pyrethrum gave efficient control of a moderate infestation by this beetle and also reduced injury by *Empoasca fabae*, Harr. Both these dusts were as efficient as 2 sprays of 3 lb. magnesium arsenate in 100 U.S. gals. water. Three applications of Bordeaux mixture (4 : 4 : 50) to lima beans was slightly less effective than one application of a dust of copper sulphate, lime and calcium arsenate followed by 2 applications of a derris dust containing 0·6 per cent. rotenone. Two applications of dusts of 1 lb. magnesium arsenate and 5 lb. lime or of copper sulphate, lime and calcium arsenate controlled beetles on garden beans. In tests with *Epitrix cucumeris*, Harr., potatoes sprayed with 3 lb. lead arsenate and 1 U.S. qt. fish oil in 100 U.S. gals. water yielded slightly more than those sprayed with Bordeaux mixture (4 : 4 : 50). A dust of 1 lb. barium fluosilicate and 3 lb. lime also controlled the beetles but the yields were not so high. In other trials, plants treated with barium fluosilicate dust in June, and with Bordeaux mixture (6 : 6 : 50) in July, August, and September gave a

very high yield, and both *Epitrix cucumeris* and *Empoasca fabae* were controlled. The yield was less when a mixture of 1½ lb. calcium arsenate and Bordeaux mixture (6 : 6 : 50) was applied. Dusts of 40 lb. crude chipped naphthalene mixed with 60 lb. lime applied 3 times to onion sets and 4 times to seed onions did not control *Thrips tabaci*, Lind., and the dusted plots appeared less healthy than the controls. Two applications of Bordeaux mixture (4 : 4 : 50) effectively controlled *E. fabae* on dahlias.

R. B. Friend gives an account (pp. 247–249) of work carried out during 1934 against the European pine shoot moth [*Rhyacionia buoliana*, Schiff.] and white pine weevil [*Pissodes strobi*, Peck]. The severe winter of 1933–34 and the control operations greatly reduced *R. buoliana*. The weevil infestation increased in some places and decreased in others.

Miscellaneous insects (pp. 249–258) included: *Phytomyza ilicis*, Curt., on *Ilex glabra* and *I. opaca*, against which a spray of nicotine and soap is recommended; *Dermestes peruvianus*, Lap., in the corrugated cardboard wrappings of a case received from Sweden; *D. nidum*, Arrow, infesting houses; *Sira* (*Seira*) *nigromaculata*, Lubb., which was troublesome in houses, and for which spraying outside the house with nicotine and soap solution and dusting inside the rooms with pyrethrum was advised; *Periplaneta americana*, L., in a rubbish dump, against which spraying with kerosene and burning the rubbish is recommended; *Dasyneura* (*Perrisia*) *pyri*, Bch., on pear; *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., heavily infesting a tree suffering from Dutch elm disease [*cf.* **22** 652]; and *Thyridopteryx ephemeraeformis*, Haw., on Norway maple [*Acer platanoides*], against which spraying with lead arsenate is advised. Turner (p. 252) describes tests with "moth-proofing materials" using wool flannel exposed to larvae of *Tineola biselliella*, Hum. Rotenone in carbon tetrachloride (1 : 1,000) and 2 proprietary compounds containing sodium aluminium fluosilicate and cinchona alkaloids respectively were tested. The rotenone solution was not satisfactory. The other compounds were very effective, but the one containing cinchona discolored white flannel and left an oily residue on the fabric. Garman and W. T. Brigham (pp. 252–253) in notes on the supposed identity of *Ascogaster carpocapsae*, Vier., with the imported species *A. quadridentata* [*cf.* **22** 491] state that 31 males and 26 females were reared from a female of *A. carpocapsae* mated with a male of *A. quadridentata*. From unfertilised females of *A. quadridentata* confined separately with eggs of *Cydia molesta* only males were obtained. In tests carried out by M. V. Anthony (p. 253), in which bean plants in a greenhouse were dusted weekly with sulphur and then placed at random among undusted plants, *Hercothrips* (*Heliothrips*) *femoralis*, Reut., and *Thrips tabaci* were repelled by sulphur. The finer grades of sulphur were the more effective. Garman (pp. 253–254) states that *Rhagoletis pomonella*, Walsh, can be reared throughout the winter under favorable conditions. Flies collected in the summer of 1933 and kept in a temperature of 75–76°F. and a humidity of 60–70 per cent. lived for an average maximum of 93 days. In 3 cages half the adults died after 42 days. Oviposition began in about 10 days, and continued regularly for from 40 to over 62 days. A total of 900 flies emerged between September and 1st January from larvae reared on green fruit, and between then and 15th February 861 flies emerged. The larvae were placed in jelly glasses in moist sand, and kept in a temperature of 75–80°F. and 40 per cent. relative humidity.

Smith (C. E.). *Larra analis* **Fabricius, a Parasite of the Mole Cricket** *Gryllotalpa hexadactyla* **Perty.**—*Proc. ent. Soc. Wash.* **37** no. 4 pp. 65–82, 3 pls., 10 refs., Washington, D.C., June 1935.

Cushman (R. A.). **A Study of the Larva of** *Larra analis* **Fabricius.**—*T.c.*, p. 82.

The first paper, which describes the bionomics of *Larra analis*, F., an important parasite of *Gryllotalpa hexadactyla*, Perty, also gives a brief note on its synonymy. It is widely distributed in the United States east of the Rocky Mountains. In the autumn of 1924, the larval habits were studied both in the field and the laboratory. There were 3 or 4 generations a year, with the majority of the adults emerging in the field in June, August and October. The female paralyses its host just long enough for it to deposit an egg. Before ovipositing, it feeds at the junction of the fore leg and the ventral part of the body. The host, which is not attacked before it is one-third or half-grown, re-enters the soil, and behaves more or less normally until it is killed by the almost mature larva. Usually one egg is placed on the host, securely glued to the body just behind the hind leg. Occasionally, two eggs are deposited on one large host, and both larvae mature. A total of 75 eggs was laid by 3 females in August 1926, one of them laying 38 eggs over a period of 2 weeks. One case of parthenogenesis was observed. The development of the immature stages is described. In periods of drought, *G. hexadactyla* seeks damp places like partially dried lakes and ponds, and the immature stages of the parasite would be killed when those places are reflooded. The larva is little affected by low temperature in the field. The egg stage usually lasts 4 days, the larval, comprising 5 instars, about 9½ days and the pupal about 35 days. The cocoon is formed in or close to the remains of the host. Sometimes the nymph frees itself from the parasite egg or larva by moulting. In 1924 nearly all examples of *G. hexadactyla* bearing unhatched eggs died, large numbers of Nematodes issuing from their bodies about the third day after death. In 1926 Nematodes were observed infesting an unhatched egg, and several were present externally on eggs that failed to hatch.

The second paper describes in detail the morphology and different stages of the larva.

Emmart (E. W.). **Studies of the Chromosomes of** *Anastrepha* **(Diptera : Trypetidae) I. The Chromosomes of the Fruit-fly,** *Anastrepha ludens* **Loew.**—*Proc. ent. Soc. Wash.* **37** no. 6 pp. 119–135, 6 pls., 14 refs. Washington, D.C., 1935.

The wide variation in the external appearance of individuals of the same species of *Anastrepha* has cast doubt on the reliability of external characters for distinguishing species. The author therefore attempted to provide cytological evidence for specific identification by studying the chromosome number and pattern in the common Mexican species. This paper deals with the spermatogonial and meiotic figures during spermatogenesis in *A. ludens*, Lw.

Michelbacher (A. E.) & Essig (E. O.). **Field Observations on the Alfalfa Weevil in Middle California.**—*Mon. Bull. Calif. Dep. Agric.* **24** pp. 221–231, 5 graphs. Sacramento, Calif., 1935.

Much of the information in this paper has already been noticed [*R.A.E.*, A **23** 172]. In the three areas, one in the San Joaquin

Valley and two to the west of it, the most western has moderate temperatures and fairly high rainfall, the most eastern has a hotter and drier climate, and the third is intermediate. Although the climate of the western area is the most favorable for the development of the alfalfa weevil [*Hypera variabilis*, Hbst.], which is likely to damage the first crop of lucerne, there are many fields in which injury is not apparent. The weevil is active throughout the year in this area, but the further east it occurs the less active it becomes, particularly in winter. An average of 35 larvae was collected in 100 sweeps of the net, and eggs were found in the stems on 5th January 1934 in a field in the western area where the lucerne was 3 ins. high. From a similar field in the intermediate area an average of 3 larvae was taken, and no eggs were found in the stems. The largest number of weevils usually occurs on the first cutting. The decline in population as the season advances is most pronounced in the eastern and less so in the intermediate area. In the western area there is generally a high larval peak for the first, third and fifth crops where these are harvested regularly, and the evidence suggests that there is more than one brood a year. From larvae placed on lucerne in field cages early in February, in March and in April, young larvae were obtained during the first part of March, and eggs on 18th June and 13th July, respectively. Young stands appear to favour the production of several broods more than older ones. In the intermediate area it is possible that the weather during the earlier part of the growing season favours the sexual development of the adults, but that high temperatures during the later part of the season retard it. If this hypothesis is true, the increase in numbers on several fields where more than one cutting was made would be due to adults that had emerged early in the season reaching maturity after the first cutting. In the eastern area larval populations are very low late in the season, but adults laid eggs after they had been brought into the laboratory. It is improbable that the weevil will become a major pest of lucerne in many parts of California. In the cooler coastal areas where it might prove injurious, damage would probably always be confined to the first cutting and could be reduced or eliminated by keeping the lucerne in a vigorous condition and cutting it as soon as it matures. A small fly is the most important of the native parasites. It infested 10 per cent. of larvae collected in September 1934.

BASINGER (A. J.). **Parasites reared from** *Argyrotaenia* (*Tortrix*) *citrana* **Fernald.**—*Mon. Bull. Calif. Dep. Agric.* **24** pp. 233–234. Sacramento, Calif., 1935.

The following parasites were reared from *Eucosma* (*Tortrix*) *citrana*, Hb., which is periodically a serious pest of oranges and grapefruit in southern California: the Braconid, *Apanteles aristoteliae*, Vier., the Ichneumonids, *Omorgus* (*Campoplex*) sp. near *phthorimaeae*, Cushm., *Nepiera* sp. and *Angitia* (*Dioctes*) *eureka*, Ashm., and a Tachinid, *Lispidea* sp. near *palpigera*, Coq., which are all endoparasites of the larvae; the Braconid, *Zele* (*Hormius*) *basalis*, Prov., and the Bethylid, *Goniozus longinervis*, Fouts, which are ectoparasitic on the larvae; an Ichneumonid, *Exochus* sp., a Chalcid *Brachymeria* sp., and a Tachinid, *Zenillia caesar*, Aldr., from the pupae; *Microbracon gelechiae*, Ashm., from the nests of the host, and *Trichogramma minutum*, Ashm., from the eggs. In heavy infestations from 75 to 90 per cent. of the host larvae may contain parasites. The following hyperparasites were also

recorded : an Ichneumonid, *Mesochorus* sp. ; *Brachymeria* sp. from a cocoon of *Apanteles aristoteliae* ; the Pteromalids, *Catolaccus aeneoviridis*, Gir., and *Habrocytus* sp., both from *Zele basalis* and *A. aristoteliae* ; and the Pteromalid, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) from an Ichneumonid cocoon.

BASINGER (A. J.). **Notes on the Parasites of the Peach Twig Borer in Southern California** (*Anarsia lineatella* **Zell.**).—*Mon. Bull. Calif. Dep. Agric.* **24** pp. 245–246, 2 refs. Sacramento, Calif., 1935.

Parasites reared from *Anarsia lineatella*, Zell., in a peach orchard in California during 1932 were *Copidosoma pyralidis*, Ashm., which was introduced in 1931 [*R.A.E.*, A **20** 215], a Eulophid of the genus *Euderus* (*Secodella*), *Elasmus setosiscutellatus*, Cwfd., the Braconids, *Microbracon mellitor*, Say, and *M. gelechiae*, Ashm., and the Tachinid, *Anachaetopsis tortricis*, Coq. Parasitism by *C. pyralidis* ranged from 30 per cent. in the corner of the orchard where the liberations had been made to 0 in the farthest corner. Only 1·67 per cent. of 2,275 individuals of *Anarsia lineatella* were parasitised by native species. In 1931, 6 of 59 hibernacula collected in the field contained dead larvae of *Anarsia* and live examples of *Pediculoides ventricosus*, Newp. This is the only record of this mite attacking *A. lineatella* since 1898.

MADER (E. O.) & BLODGETT (F. M.). **Effects of Modifications of the Potato-Spray Program.**—*Bull. Cornell Univ. agric. Exp. Sta.* no. 621, 34 pp., 13 refs. Ithaca, N.Y., February 1935. [Recd. July 1935].

The effect of treating potatoes with sprays and dusts containing copper sulphate against fungus diseases and insect pests of potato was the subject of a series of experiments in New York during 1929–33. During these years, however, fungus diseases were almost entirely absent. The following is mainly taken from the authors' summary : Colorado potato beetle [*Leptinotarsa decemlineata*, Say] was eliminated from consideration by spraying or dusting all plots, including controls, with calcium arsenate. *Epitrix cucumeris*, Harr., was present in nearly all the tests and caused some damage to a few unsprayed plants, but all sprayed and dusted plants were less punctured. Differences in pressure or in the amount of material had no great effect on the amount of injury. Injury by *Empoasca fabae*, Harr., was controlled by the application at 400 lb. pressure of 36 lb. copper sulphate per acre in the form of Bordeaux mixture. When the amount of copper sulphate was increased to 75 lb. per acre, the yield was greater. The apparent gain resulting from increased pressure was found to be due to the fact that higher pressures cause the plants to receive a heavier dose. The yield on plots sprayed with approximately 75 lb. copper sulphate per acre at 400 lb. pressure was over 100 bushels per acre more than the yield of the unsprayed plots, but an increase in the amount of material reduced the yield. The foliage developed better as the amount of copper sulphate was increased. If the growth of the foliage is stimulated early in the season, the tubers are improved, but heavy applications late in the season encouraged the foliage at the expense of the tubers. Consequently, heavier applications of copper sulphate earlier in the season are better than an even distribution throughout the season or heavy applications late in the season. Comparison of Bordeaux

mixtures made with different kinds of lime showed relatively slight differences in yield. With mixtures containing 5 lb. copper sulphate per 50 U.S. gals. water higher yields were obtained with 1 lb. lime than with $2\frac{1}{2}$ lb. or more. Apparently the copper sulphate is more soluble in mixtures containing comparatively small quantities of lime. Experiments with dusts gave comparable results. The amount of copper sulphate per acre required to give the maximum yield is slightly greater if it is applied in a dust of copper sulphate and lime than if it is applied in Bordeaux mixture, but as with the spray mixture, heavy applications should be limited to the early part of the season, and the quantity of lime should be kept down. These results were obtained with two varieties of potato planted rather late in the season in western New York, and may not apply to other varieties under other conditions.

PALM (C. E.). **The Alfalfa Snout Beetle,** *Brachyrhinus ligustici* **L.**— *Bull. Cornell Univ. agric. Exp. Sta.* no. 629, 47 pp., 28 figs., 22 refs. Ithaca, N.Y., April 1935. [Recd. July 1935.]

This is a more detailed account [*cf. R.A.E.*, A **23** 465] of an investigation on *Otiorrhynchus* (*Brachyrhinus*) *ligustici*, L., as a pest of lucerne in New York. All stages are described and its distribution is discussed. Its bionomics were found to be similar to those recorded in the European literature, extracts from which are quoted for comparison. Meteorological data for May 1934 are correlated with the weevils' activity. The weevils migrated in greatest numbers when the temperature fluctuated between 49°F. and 73°F., with an average of 61°F. The data obtained in laboratory studies on the development of the immature stages and in field studies on the distribution of the larvae in the soil, hibernation, pupation and emergence of adults are presented and analysed in tables and graphs. The more important results have already been noticed [*loc. cit.*]. Although larvae had been observed to feed as late as December in northern New York, they were forced by soil temperatures to lower levels in January 1935. On 8th January they were found at depths of from 4 to 22 ins. (average 12 ins.) and seemed to be quite inactive. In May 1934 overwintered larvae were similarly distributed. Pupation in 1934 began early in June and continued throughout most of July. Although some of the larvae moulted and fed during late May and June, the majority pupated in the same earthen cells in which they had passed the winter. The range of vertical distribution of mature larvae, pupae and newly emerged adults was nearly identical, with a maximum depth of 2 ft. and an average of 11–12 ins.

The adults fed in the field during 1934 on narrow-leaved dock (*Rumex crispus*), daffodils and various weed seedlings, in addition to the food-plants already noticed [*loc. cit.*]. In the insectary they fed on asparagus, apple, cherry, currant and grape-vine, as well as on the foliage of red clover (*Trifolium pratense*), yellow sweet clover (*Melilotus officinalis*) and white sweet clover (*M. alba*). Larvae fed on the roots of lucerne, red clover, alsike clover (*T. hybridum*), narrow-leaved dock, broad-leaved dock (*R. obtusifolius*), wild carrot (*Dacus carota*) and yellow and white sweet clover. It is not known whether they can complete development on any of the 11 other species of wild plants on which they fed in October after exhausting the supply of lucerne, but larvae were experimentally reared on the roots of several varieties of vine and on wild carrot. The slower rate of development on these

plants suggests that the presence of two distinct broods of *O. ligustici* in New York in 1934 may be due to larval development on some alternative food-plants taking 3 years instead of the normal 2. No parasitic or predatory insects have been observed in New York. There is evidence that skunks and certain birds feed on the adults, and skunks are known to dig up the larvae. From August until the end of December many diseased larvae were found in the field, and some of them were covered with the mycelial growth of a fungus, which may have contributed to their death, the cause of which was not determined.

HALLER (M. H.), BEAUMONT (J. H.), CROSS (C. R.) & RUSK (H. W.). **Spray Residue Removal from Apples.**—*Bull. Md agric. Exp. Sta.* no. 368 pp. 121–136, 9 refs. College Park, Md, September 1934. [Recd. July 1935.]

In 1933, the growing season in Maryland was favourable for the weathering of spray residues from fruit. Investigations, details of which are given, showed no excessive residues on early varieties of apples in commercial orchards that had received 2, or occasionally 3, cover sprays of lead arsenate before 15th June, a month before picking. Some varieties had more residue when the sprays were applied later. The residues on late summer varieties that had received 3, 4 and 5 cover sprays, the last applied less than a month before harvest, were above the tolerance. It should be possible to apply 3 cover sprays to autumn and winter varieties, the last as late as 1st July, without excessive residues occurring at harvest [*cf. R.A.E.*, A **19** 631]. For washing tests, three different machines were used with equal results. The principles and methods of washing are described. The tests indicated that residues on apples sprayed with lead arsenate and a fungicide without oil can be brought below tolerance by washing with hydrochloric acid (0·5 per cent. by weight) at room temperature [*cf.* **23** 549]. If the late cover sprays contain mineral oil, the efficiency of the washing solution can be improved by raising its temperature to 100°F., and by increasing the hydrochloric acid to 1·5 per cent., with or without the addition of 1·2 per cent. salt and 0·5–1 per cent. wetting agent. The best results were obtained by 1 per cent. salt and 0·5 per cent. wetting agent added to a 1·5 per cent. hydrochloric acid solution [*cf.* **20** 140]. When it is not possible to change the rinse water frequently, the addition of lime will neutralise the acid and render insoluble the arsenic pentoxide carried into the tank [*cf.* **20** 44]. The technique and equipment for testing acid strength is described. Sodium silicate solutions, though effective with waxy fruit harvested late or held in storage [*cf.* **22** 217, etc.], do not give as good results as hydrochloric acid.

MENDES (D.). **Nota sobre** *Anaphothrips orchidearum* **Bondar (Thysanoptera).**—*Rev. Ent.* **5** no. 2 p. 234. Rio de Janeiro, June 1935.

Anaphothrips orchidearum, Bondar, which was described from various orchids in Bahia, Brazil [*R.A.E.*, A **20** 107], is here recorded from other varieties of orchids in Rio de Janeiro and the State of Minas Geraes.

ROARK (R. C.). **Insecticides and Fungicides.**—*Industr. Engng Chem.* **27** no. 5 pp. 530–532. Easton, Pa, May 1935.

After giving a list of the quantities of the principal insecticides and fungicides used in the United States during 1934, the author reviews

the development of insect control by insecticides and indicates the scope and problems of future research, with particular reference to the replacement of inorganic insecticides, especially arsenicals, by organic products, which are more toxic to insects and less so to mammals [*cf. R.A.E.*, A **23** 326].

FENNAH (R. G.). **A preliminary List of the Pentatomidae of Trinidad, B.W.I.**—*Trop. Agriculture* **12** no. 7 pp. 192–194. Trinidad, July 1935.

This list of Pentatomids collected in Trinidad between October 1933 and June 1934 comprises 27 species. *Nezara viridula*, L., is the only one of much economic importance, but it is not a major pest. In Trinidad it attacks herbaceous plants such as soy beans and tomato but does not infest *Citrus*. *Piezodorus guildingi*, Westw., is commonly found on soy beans, *Mecistorhinus picea*, P. de B., on young shoots of cacao, and *Edessa meditabunda*, F., on *Hibiscus* and soy beans. *Mormidea ypsilon*, L., is sometimes abundant on *Setaria sulcata* in cacao plantations, but it apparently does little to check the growth of the weed.

St. Vincent. Plant Protection Ordinance, 1935. Government Notice no. 14.—pp. 35–46. Kingstown, St. Vincent, 2nd May 1935.

This Ordinance defines the conditions governing the importation of plants into St. Vincent, the disinfection of imported plants and the powers of the Governor and of the Agricultural Authority for this purpose. Provision is also made for the enforcement within the Island of measures against any pest or disease of plants that may be declared by proclamation to be notifiable.

The Plant Pest and Disease Regulations, 1934. Government Notice no. 130.—*Tanganyika Terr. Gaz.* **15** no. 55. Suppl. Dar-es-Salaam, 23rd November 1934.

This notice provides for the compulsory destruction in Tanganyika Territory of the alternative food-plants [*cf. R.A.E.*, A **22** 441] of the coffee stem borer [*Anthores leuconotus*, Pasc.], to which *Paretta olivieriana* and *Rytigynia schumanii* are added.

The Plant Pest and Disease (Sisal) Regulations, 1935. Government Notice no. 83.—*Tanganyika Terr. Gaz.* **16** no. 27 Suppl. Dar-es-Salaam, 14th June 1935.

To prevent the spread in Tanganyika Territory of *Scyphophorus acupunctatus*, Gyll., the introduced Central American weevil infesting sisal (*Agave*), this Notice prohibits the removal of plants, bulbils and suckers (but not seeds) of *Agave* from Tanga Province except under permit.

NEWMAN (L. J.) & JENKINS (C. F. H.). **Accidental Oviposition by a Species of Dragon Fly in Tomato Fruits.** (*Aeschna brevistyla*, **Rambur**).—*J. Dep. Agric. W. Aust.* (2) **12** no. 2 pp. 154–156 4 figs. Perth, June 1935.

Eggs of *Aeschna brevistyla*, Ramb., which hatched after 3 weeks, were found in the fruits of tomato in Western Australia. From some

of them a Mymarid parasite emerged. *A. brevistyla*, the life-history of which is briefly sketched, normally oviposits in the tissues of plants that grow in or close to water.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **46** pt. 6 pp. 327–332, 8 figs. Sydney, 1st June 1935.

This paper, which belongs to a series on insect pests in New South Wales [*cf. R.A.E.*, A **23** 508, etc.], includes notes on *Lecanium pruinosum*, Coq., which attacks stone fruit and other trees and can be destroyed by dormant sprays of miscible oil (1 : 20) ; *Anuraphis persicae-niger*, Smith (black peach aphis), against which miscible oil (1 : 25) can be used during the dormant period but not after the peach buds begin to swell ; and *Tiracola plagiata*, Wlk., which has occasionally damaged banana on the north coast of New South Wales, but is much more injurious in Queensland [*cf.* **18** 465, 466].

Zeck (E. H.). **Development of Black Cherry Aphids on Secondary Host plants.**—*Agric. Gaz. N.S.W.* **46** pt. 6 p. 332. Sydney, 1st June 1935.

On 20th September 1933, 50 examples of *Myzus cerasi*, F., collected on cherry in New South Wales were placed on shoots of two potted Japanese flowering cherry plants. By 15th October 1933 the young shoots were covered with Aphids and had begun to shrivel. About 50 of these Aphids were then transferred to cress (*Lepidium sativum*), on which reproduction continued until the third week in January 1935. Continuous feeding on cress reduced the numbers and size of the Aphids. Winged females were numerous during December 1933 and a winged male was seen early in June 1934. No oviparous females were observed. *M. cerasi* has not been found on a secondary food-plant in the field in Australia.

van der Goot (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1933.** [Diseases and Pests of cultivated Plants in the Netherlands Indies in 1933.]—*Meded. Inst. PlZiekt.* no. 84 79 pp. Buitenzorg, 1935. Price *Fl.*1·50.

Brief notes are given on the pests observed during the year in various parts of the Netherlands Indies. The more injurious included *Plagiodera inclusa*, Stål, on soy beans, *Artona* (*Brachartona*) [*catoxantha*, Hmps.] on coconut, the Coreid, *Dasynus* [*piperis*, China] on pepper [*Piper nigrum*] ; the coffee berry borer [*Stephanoderes hampei*, Ferr.], coffee twig borers [*Xyleborus*], and *Pseudococcus citri*, Risso, on coffee ; and *Helopeltis* on cinchona and tea.

van Vuuren (L.). **Waarnemingen omtrent** *Phanurus beneficiens* **(Zehnt.) (Hym., Scelionidae) op** *Schoenobius bipunctifer* **Walk. (Lep., Pyralidae).**—*Ent. Meded. Ned.-Indië* **1** no. 2 pp. 29–33, 1 fig. Buitenzorg, 1st June 1935. (With a Summary in English.)

In a number of instances, one or more adults of *Phanurus beneficiens*, Zehnt., a parasite of the eggs of *Schoenobius bipunctifer*, Wlk., have been found in Java attached to the wings or body of the host, which carried them in flight. They were only found on female moths, and the maximum number on an individual was 8. The ways in which they they were attached are described in detail.

HERFORD (G. M.). **A Key to the Members of the Family Bruchidae (Col.) of economic Importance in Europe.**—*Trans. Soc. Brit. Ent.* **2** pt. 1 pp. 1–32 4 pls., 9 refs. Southampton, 8th July 1935.

This key to subfamilies, genera and species is based on external characters. It is confined almost exclusively to Bruchids that are of economic importance in European countries and occur or are likely to occur in Britain. Brief descriptions of the species are also given, and their distribution and food-plants are shown.

UVAROV (B. P.). **A new Name for the Genus *Gryllus* auct., nec. L.**—*Ann. Mag nat. Hist.* (10) **16** no. 92 p. 320. London, August 1935.

The new name *Gryllulus*, with *Gryllus domesticus*, L., as the type, is proposed for the large group of allied species that have been left without a generic name owing to the selection by the International Commission of Zoological Nomenclature of *campestris*, L., formerly included in the genus *Liogryllus*, Saussure, as the type of *Gryllus*, Linnaeus.

SMITH (K. M.). **Some Diseases of Ornamental Plants caused by the virus of Tomato Spotted Wilt.**—*J. R. hort. Soc.* **60** pt. 7 pp. 304–310, 4 pls. London, July 1935.

Notes are given on symptoms produced in tomatos and a number of ornamental plants belonging to 11 different families by the virus of spotted wilt disease, which is mainly transmitted either by *Thrips tabaci*, Lind., or by vegetative propagation of infected plants. They are very different in different plants. The chief methods of combating the disease in greenhouses are the elimation of *T. tabaci* and the removal and destruction of all diseased or suspected plants. Tomatos should be kept away from such plants as dahlias and arum lilies (*Zantedeschia aethiopica*). The thrips is best controlled by using a nicotine fumigant ; for thrips on arum lilies powdered naphthalene (grade 16) should be broadcast over the plants at the rate of 10 oz. per 1,000 cu. ft.

JACKSON (D. J.). **Further Notes on Parasites of the Magpie Moth (*Abraxas grossulariata* L.) in Scotland.**—*Scot. Nat.* no. 214 pp. 89–98, 8 refs. Edinburgh, 1935.

Further notes [*cf. R.A.E.*, A **22** 631] are given on parasites obtained from *Abraxas grossulariata*, L., on gooseberry and *Euonymus japonicus* in Scotland. Larvae of *Casinaria* (*Trophocampa*) *vidua*, Grav., emerged, one from each host larva, about the end of May and spun cocoons within 24 hours. The adults emerged about 3 weeks later. Nothing else seems to be known of its life-history. Two females fed on water and raisins survived until the beginning of September. From two small host larvae were obtained a single adult of *Rhogas circumscriptus*, Nees, and a species of *Mesochorus* that was probably a hyperparasite attacking this Braconid. *M. angustatus*, Thoms., emerged from the cocoon of another Braconid, almost certainly *Apanteles limbatus*, Marsh. Of 52 pupae of *Abraxas* examined in 1933, 2 were parasitised by Tachinid larvae, 2 by *Pimpla examinator*, F., 1 by 15

undetermined Ichneumonid larvae, and 28 by *Ichneumon* (*Stenichneumon*) *trilineatus*, Gmel. Half the pupae infested by *I. trilineatus* were hyperparasitised by *Habrocytus moerens*, Wlk. Investigations since 1933 [*loc. cit.*] on *I. trilineatus* have shown that it has one generation a year. The adults emerge from the pupae of *A. grossulariata* in July and pair readily in captivity. The males die in August or September but the females do not oviposit until the following May. They continue to do so until a few days before their death at the end of June. Unlike *P. examinator*, the female never feeds on the host. Although sometimes more than one egg is laid in each host, only one larva reaches maturity. From two unmated females, 19 males were bred, but in the offspring of fertilised females the sexes were about equal. Development from egg to adult requires 32–38 days, the larval stage (with 5 instars) lasting 16–17 and the pupal about 10–15.

Miles (H. W.) & Cohen (M.). **The Glasshouse Symphylid and its Control.**—*J. Minist. Agric.* **42** no. 5 pp. 450–457, 4 pls., 9 refs. London, August 1935.

A report is given of investigations made after the outbreak of *Scutigerella immaculata*, Newp., in England in 1930 [*cf. R.A.E.*, A **19** 606]. Its morphology and bionomics are described. The eggs are laid in batches of 2–20, occasionally covered with silk and attached to soil particles or decaying roots. They hatch in a fortnight. The larval stage comprises several instars and lasts about 5 or 6 weeks. The roots of young tomatos, lettuce and sweet peas are severely attacked. Lettuce may be attacked as early as November and injury continues until February or March. The Scolopendrellids, which are most active at 50–60°F., chiefly infest the top inch of soil, but descend to the subsoil to escape from unsuitable conditions. They concentrated in the top 3 ins. when seedlings were planted out, even though the surface temperature was above the optimum.

Reference is made to steam sterilisation and soil fumigants as means of control [*cf.* **20** 42; **21** 558]. Preliminary experiments in 1933 showed that an emulsion of equal parts of carbon bisulphide and sulphonated castor oil in water at strengths of 1 : 60 and 1 : 80 would kill *Scutigerella* in 15 minutes. Plants suffered some injury when their stems were splashed by the emulsion. In further tests Scolopendrellids in cylinders of soil were killed by concentrations of 1 : 100 at a depth of 3 ins., 1 in 80 at 6 ins. and 1 in 60 at 10 ins. In a glasshouse, where the soil was trenched, the subsoil treated with 1 gal. of a 1 : 60 emulsion per sq. yd. and the surface with 2 gals. of a 1 : 100 emulsion per sq. yd. before tomatos were planted, only 2 Scolopendrellids were subsequently found on 32 plants, whereas in the control there were 221 on 25 plants. If the soil is not treated before planting, a 1 : 120 emulsion should be applied 3 times at weekly intervals to the soil 2 ins. from the plants at the rate of ½ pint for each.

Martelli (G.). **Altre notizie biologiche della mosca delle Olive.** [Further biological Notes on the Olive Fly.]—*Propag. agric.* 1935 no. 5 reprint 3 pp. Taranto, 1935.

In laboratory experiments at Taranto females of *Dacus* [*oleae*, Gmel.] punctured olives without ovipositing and sucked the juices at the lesions. Even when an aqueous solution of glucose and honey was

available, the flies did not feed on it until the olives were dried up. When no other nourishment was available, the flies lived on the juices for eleven days. This habit partly accounts for the failure of bait-traps in southern Italy and Sicily.

SERVADEI (A.). **Appunti biologici e morfologici sull'** *Eurydema ornatum* **L.** (**Hemiptera-Heteroptera**). [Biological and morphological Notes on *E. ornatum*.]—*Boll. Lab. Ent. Bologna.* **7** pp. 303–337, 15 figs., 1 pl., 19 refs. Bologna, 15th June 1935.

The egg, five nymphal instars and adult of *Eurydema ornatum*, L., are described. The newly-emerged adult only gradually acquires the colour characteristic of the species ; some of the variations it undergoes correspond to published descriptions of varieties. In 1933 and 1934 two generations a year were observed in Emilia, where this Pentatomid was particularly harmful to cabbages in the neighbourhood of Bologna. Overwintered adults and the nymphs that hatched from their eggs were more injurious than adults of the first generation, which oviposited on various plants besides crucifers. Adults emerged from hibernation early in April. They preferred cabbages in flower. They punctured the ovaries, siliquae and leaves, and sometimes fed on other plants such as lucerne. They paired and began to oviposit in the second half of April. The eggs hatched in about 15 days at 15°C. [59°F.] and 58 per cent. humidity. The adults of the first generation appeared in June, and those of the second (hibernating) generation in August and September. A Scelionid, *Trissolcus simoni*, Mayr, parasitised the eggs of both generations, but was not numerous.

If *E. ornatum* is abundant enough to cause severe injury, the eggs of the first generation should be collected and the nymphs and adults should be caught in nets. Sprays of tobacco and soap are effective against the nymphs and adults.

CONSTANTINO (G.). **Contro la mosca delle frutta.**—*Note Fruttic.* **13** no. 7 pp. 121–128. Pistoia, July 1935.

This is an account of experiments with baits against *Ceratitis capitata*, Wied., in 1933–34 at Acireale, Sicily. Glass traps [*R.A.E.*, A **18** 179] and circular dishes of aluminium, 10 ins. in diameter and 3½ ins. high, with edges curved inwards to prevent spilling, were hung in the fruit trees. A decoction of dried figs, made by boiling 1 lb. figs. in 1 gal. water for half an hour was more attractive than any other bait. Of molasses baits, Dachicida F. [**21** 440] was the best.

The females had deposited most of their eggs before being caught, for in 296 females taken in traps the average number of mature eggs was 11, and the maximum 49, whereas in 215 captured on the trees or in flight the average was 38 and the maximum 74. The traps caught most flies in October and November, when infested fruits had already fallen and mandarine oranges were still green. Ripening fruits were heavily infested, although 6 traps were hung in each tree. Apparently the baits attracted the flies to the trees, where the females oviposited before being caught. Many bees and parasitic Hymenoptera were also destroyed. For these reasons the author thinks that it is practically useless to try to control the fruit-fly by bait-traps. Valuable fruits should be enclosed in bags of gauze or parchment paper. Infested fruits should be kept under water until the larvae are dead.

Blunck (H.). **Moderne Verfahren zur Bekämpfung von Pflanzenkrankheiten und -schädlingen.** [Modern Methods for the Control of Plant Diseases and Pests.]—*Bremer Beitr. Naturw.* **2** no. 2, reprint 29 pp., 5 figs., 5 pls. Bremen, 1934. [Recd. June 1935.]

This is a general survey of modern methods for combating diseases and pests of plants. Except for a few, such as adhesive bands, mechanical devices have been replaced by chemical insecticides. The ways in which they are applied by means of sprayers, dusters and fumigation equipment are outlined. There are also notes on biological control, the production of plants resistant to attack, and the study of the epidemiology of pests and of the factors influencing their abundance.

Kartoffelkäfer-Nummer. [Colorado Potato Beetle Number.]—*NachrBl. dtsch. PflSchDienst* **15** no. 7 pp. 61–67, 11 figs. Berlin, July 1935.

The outbreak of *Leptinotarsa decemlineata*, Say, at Stade on the Lower Elbe in 1934 [*R.A.E.*, A **22** 560] was successfully suppressed, but the beetle is spreading through France towards Germany. This issue mainly consists of an account by M. Schwartz of the various items of the expenditure at Stade in 1934 ; a map by E. von Winning of the distribution of the beetle in France in the autumn of that year and an abstract of Fryer's report on the infestation in England [**23** 220].

[Lozina-Lozinskiĭ (L. K.).] **Лозина-Лозинский (Л. К.). Cold Resistance in some Insects.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 15–22, 3 graphs. Leningrad, 1935. (With a Summary in English.)

Experiments were made in Leningrad to determine the resistance to cold of the larvae of *Euxoa segetum*, Schiff., *Loxostege sticticalis*, L., and *Pyrausta nubilalis*, Hb. Their cold-hardiness was determined by their capacity to endure freezing and under-cooling during hibernation and during the period of activity. When the free water in its body congeals, the insect dies. It was found that when larvae were subjected to gradually decreasing temperatures that went below the point at which free water in that species of insect freezes, they did not become hard, but when the temperature descended suddenly they became more or less hard. The degree of hardness was in relation to the time for which they were exposed to freezing temperatures. Larvae of *P. nubilalis*, which have a freezing point of −5°C. [23°F.], can stand undercooling during hibernation to about −21°C. [−5·8°F.], and larvae of *L. sticticalis*, with a freezing point of −3°C. or −4°C. [26·6–24·8°F.], can be under-cooled during hibernation to between −18 and −27°C. [−0·4 and −16·6°F.]. A rise of environmental temperature to 3–5°C. [37·4–41°F.] at the beginning of spring resulted in a loss of cold-hardiness in *L. sticticalis* and *E. segetum*. After larvae of *P. nubilalis* had been exposed for some time to 20°C. [68°F.] or more, they froze more easily (probably because free water had been formed within their tissues), and those that survived were killed by under-cooling to −5 or −7°C. [23–19·4°F.] [*cf. R.A.E.*, A **15** 253, 339]. Processes of development, especially histolysis, that take place after the diapause make the larvae less resistant to cold. Thus larvae of *L. sticticalis* at this stage could not withstand under-cooling to temperatures lower than −1 or

—3°C. [30·2–26·6°F.]. Consequently sudden frost after the snow melts and the larvae have begun to pupate may prove fatal. When the larvae are feeding, and particularly after 24 hours' starvation, their resistance to cold is at its lowest, since the free water that forms outside the cells is readily frozen.

There is a close relation between the cold-hardiness of the larvae of the three species and their respective conditions of hibernation. The larvae of *E. segetum*, which are the least resistant, hibernate in the soil at a depth of 6–8 in. under a thick cover of snow, which prevents the temperature of the soil from dropping below the freezing point [*cf.* **18** 642]. This species therefore survives best in northern regions, where the temperature drops to —25°C. [—13°F.] but where there is a deep snow cover, and it does not occur in numbers in southern areas, where the snow often disappears during the winter [*cf.* **17** 126]. The larvae of *L. sticticalis*, which pass the winter in cocoons in a state of diapause, can survive in the steppe and semi-desert zones in the upper layer of the soil at a depth of about 1½ in. Their distribution towards the north is only checked by the rather low temperatures in the spring, sudden frosts and dampness of the soil. The larvae of *P. nubilalis*, which are the most hardy, hibernate in a state of diapause in the stems of maize, hemp or weeds. During the diapause they can resist very low temperatures and sharp repeated changes in temperature. Reactivation in the central zone of the Russian Union at the end of May and beginning of June coincides with the establishment of warm weather.

[Kozhanchikov (I. V.).] **Кожанчиков (И. В.). The Distribution of injurious Cutworms and their phylogenetic Development.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 23–40, 4 maps. Leningrad, 1935. (With a Summary in English.)

On the basis of investigations into the distribution, with special reference to the Russian Union, of 30 injurious species of cutworms belonging to 5 genera, the author divides them into four groups. The first, comprising species that require warmth and moisture, occurs in the zone of broad-leaved forests of the Mediterranean region. The second group is found mainly in virgin forests of the northern hemisphere, and is for the most part limited by the July isotherm of 12–20°C. [53·6–68°F.]. The third group, which is the largest of all and includes 5 species of *Agrotis* and 5 of *Euxoa*, occurs mostly in steppe forests and humid steppes and is limited by the July isotherm of 16–24°C. [60·8–75·2°F.]. The fourth group contains species that are distributed in deserts in the northern hemisphere within the July isotherm of 24–28°C. [75·2–82·4°F.].

[Rubtzov (I. A.).] **Рубцов (И. А.).** *Haplothrips tritici* **Kurd. and the Coefficient of its Injury.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 41–46. Leningrad, 1935.

To determine the co-efficient of injury [*cf. R.A.E.*, A **14** 285] caused by *Haplothrips tritici*, Kurdj. [*cf.* **19** 285] to wheat in Irkutsk, the number of thrips on freshly plucked ears was counted and the weight of single infested and uninfested grains was compared. This method was adopted on the assumption that a larva feeds all the time on the same ear. The results are shown in tables. On an average 70 per cent. of the grains were infested. The number of thrips on individual grains

varied from 1 to 5 or more. Severe infestation reduced the mean weight of infested grains by 5 per cent. Grains attacked by 5 or more thrips lost 10 times as much weight as grains attacked by only one thrips.

[Zagovora (A. V.).] **Заговора (А. В.). *Oria musculosa* Hbn. in the eastern Steppe of the Ukrainian SSR in 1930–1934.** [*In Russian.*] —*Plant Prot.* 1935 fasc. 1 pp. 47–52. Leningrad, 1935.

Outbreaks of *Oria musculosa*, Hb., occurred in the eastern Ukraine in 1931, 1932 and 1934 on cereals, including barley, oats, rye, wheat, and maize. In 1932 nearly 1,000 sq. miles were infested. The local distribution of the Noctuid is discussed and the percentages of damage are shown in tables. In 1931 the yields of maize and spring sown wheat were reduced by over 52 and 44 per cent. respectively. In maize the larvae bore spirally from the top to the base of the stem, which they sometimes sever. They seldom attacked the cobs. They damage the stems of wheat and other cereals when the tillers and grains are forming and they also attack the ears. In the laboratory, larvae destroyed from 15 to 25 stalks each. In the field, eggs were also laid on the stubble and on couch grass [*Agropyrum*] and *Avena pubescens*. Infestation was highest in fields in which cereals had been grown during the preceding year, and lowest in those that had lain fallow. Autumn ploughing to a depth of about 7 ins. reduced infestation. In the laboratory, when eggs were covered with layers of friable soil, 79·9 per cent. of the larvae came to the surface from under a layer 3–4 ins. thick, but only 12·1 per cent. came through a layer 7–8 ins. thick. Burning the stubble gave good results.

[Shchegolev (V. N.).] **Щеголев (В. Н.). Let us realize our Attainments in the Corn Borer Control in the Hemp Industry.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 53–54. Leningrad, 1935.

[Dmitriev (G. V.).] **Дмитриев (Г. В.). The Results of Work on Estimation of the Efficiency of the System of Measures in the Corn Borer Control in the Hemp Industry.** [*In Russian.*]—*T.c.* pp. 55–62.

[Kharitonov (Ya. N.).] **Харитонов (Я. Н.). Preliminary Estimation of the System of Measures and its Efficiency in the Corn Borer Control for the collective Farms in the Gorky District.** [*In Russian.*]—*T.c.* pp. 63–68, 1 graph.

In the first paper, which is introductory, it is stated that the European corn borer [*Pyrausta nubilalis*, Hb.] reduced the yield of hemp fibre in the Russian Union during 1931–33 by about 50,000 tons. A campaign was begun in 1931 in some of the districts where hemp is extensively cultivated, and in 1933 the effectiveness of various agritural control measures was estimated in special experiments, and by a survey of the condition of hemp on farms where some control had been carried out. The results indicate that the measures were very effective, and their use on all collective farms is consequently recommended.

The second paper deals with experiments in the Department of Penza on a selected farm in which hemp straw left in the field after the harvest of the preceding year, stacked straw and weeds were found to be heavily infested in the spring by overwintered larvae. To control

these, the straw was sent to the factory or worked on the spot before the emergence of the adults, all the hemp refuse was burnt, the thatched roofs made from infested hemp stalks were removed and sent to the factory, and weeds were cut down and burnt. The number of larvae was thus reduced by 89 per cent., and the damage was less than 8 per cent. of that caused in 1932. The yield of hemp fibre was 15 per cent. greater than it was on the control. A comparative table shows that the various anti-larval measures, which form a system of control, are the methods commonly used in farming and in the preliminary handling of hemp. Their application would not therefore entail greater expense.

The third paper gives a brief survey of the campaign carried out on some farms in the Department of Nizhniĭ-Novgorod in 1931–33. Where hemp refuse was removed from the fields in the autumn and burnt, the soil ploughed to a considerable depth, and the straw sent to factories, or retted in the spring before the emergence of the adults of the borer, the infestation was reduced to an average of 3 and 4 per cent. as compared with 35 and 70 in 1931.

[Zimin (G. S.).] **Зимин (Г. С.). Using *Trichogramma* to control the Corn Borer in the Field.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 69–80, 3 diagr. Leningrad, 1935.

This is a preliminary account of field experiments in the North Caucasus in 1934 on the control of *Pyrausta nubilalis*, Hb., on maize by means of *Trichogramma evanescens*, Westw., which in 1933 destroyed in that district 94·4 per cent. of the eggs at the end of July and 83·5–100 per cent. in late August and early September. The way in which the parasite was bred in the eggs of *Sitotroga cerealella*, Ol., is described. As *Pyrausta* began to oviposit on the experimental plots of maize from 28th May, the parasites were liberated from 1st June onwards, cards with parasitised eggs of *Sitotroga* being placed in the plots. Details of the liberations are presented in tables, and the rates of oviposition of the first and second generations of the borer and of the parasitism of the eggs by *Trichogramma* in diagrams. The rate of the natural parasitism in the control plots was 28–29 per cent. in eggs laid in June–July, but increased to 70–74 per cent. in eggs laid in August. In the plot in which the parasites were most successful they were released at the rate of 26,300 per acre and 64·9 per cent. of the eggs laid in June–July were parasitised. Parasitism of the eggs laid in August was, however, practically the same as in the control plots. Nevertheless only 3·24 of the maize cobs were injured by *Pyrausta* as compared with 16·5 in the latter.

[Nikol'skaya (M. N.).] **Никольская (М. Н.). Pistacia-seed-eating Chalcidids and their Parasites (Hymenoptera, Chalcididae).** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 81–87, 7 figs. Leningrad, 1935.

In 1930–32 the fruits of *Pistacia mutica* in the Crimea and Transcaucasia and of *P. vera* in Transcaucasia and Turkmenistan were infested by larvae of *Megastigmus pistaciae*, Wlk., which destroyed the seeds. A description is given of the female of this Torymid, of which *M. ballestrerii*, Rond. [*R.A.E.*, A **4** 382] is considered a synonym. *Eurytoma plotnikovi*, Nikol'skaya [**22** 263], the larva and adults of which are described, was obtained from the fruits of *P. vera* in southern Turkmenistan, where in 1930 it destroyed about 90 per cent. of the crop.

Notes, with descriptions of both sexes, are given on four parasites reared from *M. pistaciae, viz., Eurytoma setigera,* Mayr, *Dinarmus pistaciae,* sp. n., *Decatoma biguttata,* Swed., and *Eupelmus urozonus,* Dalm. All were obtained in the Crimea and the first two also in Turkmenistan. A key to the subfamilies and genera of the species discussed is appended.

[Ruizhkov (B.).] **Рыжков (Б.). Virus Diseases of Plants and their Control.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 88–96, 3 refs. Leningrad, 1935.

This paper opens with a brief discussion of the importance of virus diseases of cultivated plants, with special reference to the losses caused to crops in the Russian Union. Theories about the nature of the filtrable virus are reviewed from the literature. The part played by insects and other agents and factors in the spread of the diseases is discussed and general recommendations for preventing or diminishing the effects of each are given. Remedial measures are indicated in a table of susceptible crops.

[Shpet (G. I.).] **Шпет (Г. И.). Establishing the Number of Instars in Insects by applying Variation-Statistics Methods.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 97–102, 1 fig., 2 graphs, 13 refs. Leningrad, 1935.

This paper contains a brief account of laboratory studies on *Blatta orientalis,* L., and various locusts and grasshoppers, in the course of which the instar and age of the larvae was exactly determined by measuring the width or length of chitinised parts, especially the head, the antenna and the femur. The dimensions of these parts hardly change at all between the moults, but they exhibit fairly constant differences from instar to instar, so that a series of dimensions showing their growth from stage to stage and their size in any given stage can be obtained. In the more advanced instars the sexes had to be separated in order to obtain correct data about the age of the individuals. The reliability of this method is supported by evidence from the literature [*cf. R.A.E.,* A **17** 178; **21** 58; B **20** 154].

[Pivovarov (V. M.).] **Пивоваров (В. М.). Methods of Control used against the Sugar Beet Web Worm (*Loxostege sticticalis* L.) with an Estimate of their Efficiency.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 103–114, 23 refs. Leningrad, 1935.

During an outbreak of *Loxostege sticticalis,* L., in Voronezh in 1933, experiments were carried out in June in special plots of fodder beet to determine the effectiveness of various common control methods, chiefly agricultural. Tables show the results. Sprays of Paris green, sodium arsenate and calcium arsenate, applied when the plants had 3–6 pairs of leaves, reduced infestation and increased the yield. Weeding the fields before and during the mass flight of the moths safeguarded the crop from infestation, since eggs are mostly laid on weeds [*cf. R.A.E.,* A **20** 262, 627]. When the larvae are in the second and third instars, weeds should be left on alternate strips 6–8 ins. wide, as the larvae will then concentrate on them and at the same time the beet will get sufficient light and air. Ploughing to destroy larvae hibernating in cocoons should be made compulsory. As it has more foliage,

early sown beet tolerates infestation better than late sown beet. The moths mostly oviposit on low weeds, and hardly ever lay eggs on tall wild plants. In a plot over which a net 22 yards long had been dragged to catch the adults, there were afterwards as many larvae as there were in the controls.

[Stepantzev (I. N.).] **Степанцев (И. Н.). Types of Damage caused to Cotton Plant Foliage by the Red Spider.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 119–120. Leningrad, 1935.

Variations in the size, colour and situation of the reddish-brown stains caused by the feeding of the red spider [*Tetranychus*] on the leaves of cotton in the Russian Union depend on such factors as the abundance of the mites, the length of the infestation, the condition and variety of the cotton, and the relation between the mites and associated insects. Localised colonies of the mites cause small, sharply defined spots of a bright colour along the edge of the leaves. As their numbers increase, the spots spread over the surface, appearing mostly in places with a tender parenchyma. Where irrigation is insufficient, the mites concentrate on the edges and infested leaves are bordered with a continuous narrow strip. When thrips are present, the mites usually infest the upper and the thrips the lower tier of the foliage. Leaves infested by thrips do not drop, so that cotton attacked by both thrips and mites yields more than cotton attacked only by mites. Leaves damaged by the thrips become coarse and thick and are therefore rarely infested by the mite. If the mites are destroyed by such predators as *Scymnus* and *Stethorus*, which are very active, the reddish stains gradually disappear and a new green parenchyma begins to grow along the veins, forming a marbled pattern. These leaves do not usually drop, and the plants develop normally. Control measures against the mite, especially with substances that may kill the Coccinellids, should not be carried out on these plants.

[Andreev (S.) & Balkashin (B.).] **Андреев (С.) и Балкашин (Б.). Application of high Frequency Currents to Flour-mite Control.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 121–123, 1 diagr. Leningrad, 1935.

The possibility of killing flour mites by high frequency electric currents was studied in preliminary laboratory experiments in Leningrad. Batches of wheat grains weighing 1·4 oz., with a moisture content of 14–15 per cent., were artificially infested with mites, including *Tyroglyphus* (*Aleurobius*) *farinae*, DeG., *Glycyphagus cadaverum*, Schr., *T. dimidiatus*, Herm. (*longior*, Gerv.) and *Cheyletus eruditus*, Schr., and placed in paper containers between two horizontal copper plates receiving currents of high frequency. The installation provided waves ranging in length from 8 to 40 m., but the experiments were carried out chiefly with a wave length of 11 m. and exposures of 15–120 seconds. The results are given in a table showing the mortality of the mites and the effect of treatment on the germination of the seeds. The exposure raised the temperature of the grain to 40–70°C. [104–158°F.] and more. The mites were killed more quickly by short waves. A wave length of 11 m. killed the mites in 30 seconds, but a wave length of 40 m. took 5 minutes. An exposure of 30 seconds or longer to a wave length of 11 m. killed all the mites at once, but some revived within 2 minutes of

an exposure of 15–25 seconds, although they were dead on the fourth day. Exposures of 1–2 minutes greatly impaired and sometimes destroyed the power of the seeds to germinate. The high temperatures that developed with exposures of this length were probably responsible. Exposures of 15–25 seconds slightly increased germination power. These experiments suggest that even minimum exposures may be effective, as they impair the vitality of the mites and kill them in a few days.

In experiments with wood infested with borers, the beetles were killed by currents of high frequency in 3–5 minutes.

[Vasil'ev (I.).] **Васильев (И.).** *Acanthoscelides obtectus* **Say under Field Conditions in Abkhazia.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 124–130, 5 refs. Leningrad, 1935.

Field observations on *Bruchus* (*Acanthoscelides*) *obtectus*, Say, on beans round Sukhum (on the Black Sea coast of Georgia) showed that unlike *B. pisorum*, L., on peas, it never infests green unripe pods, but only attacks mature ones with a more or less dry shell. The females are probably attracted by the peculiar and rather strong smell of these pods. Oviposition lasts from July to the end of November. The eggs are laid on the seeds or on the inner side of the shell through cracks in the pods or through slits which the female gnaws in the rib of the pod. As a rule, 2 or 3 slits are made in a pod, and as many as 20 eggs may be deposited through one slit. The total number of eggs laid by a female in August–September was 50–55, and the maximum number in a thermostat at 27·5°C. [81·5°F.] and a humidity of 79 per cent. was 106. About 10 per cent. of the eggs do not develop.

The egg stage lasted 6–7 days in July at a mean temperature of 24°C. [75·2°F.] and 75–78 per cent. humidity, and 11 days in autumn at 15–17°C. [59–62·6°F.] and 78–80 per cent. humidity. From 2 to 4 days may pass before the young larvae penetrate into the seeds. The larval stage lasted 21–32 days in July–August at 21–29°C. [69·8–84·2°F.] and 35–36 in autumn at 16–23°C. [60·8–73·4°F.]. As many as 18 larvae may occur in a seed of the common bean, *Phaseolus vulgaris*, and as many as 27 in the larger seed of *P. multiflorus*. The pupal stage in July–August lasted 7–8 days. Often over 50 young adults emerge from one pod. Pairing takes place soon after emergence and oviposition begins 1–2 days later. The adults lived without food for 2 months in September–October at 15–18°C. [59–64·4°F.] and 73 per cent. humidity, and for 3 months at 7–12°C. [44·6–53·6°F.]. Beetles kept without food at 33·6°C. [92·4°F.] and 78 per cent. humidity only lived about a fortnight, but beetles kept at 10·9°C. [51·6°F.] lived for 2½ months. There are probably at least 4 generations a year, of which 2 may develop in the field. The first field generation develops in August–September in 5–6 weeks, and the adults are on the wing during the whole of September and most of October. The development of the second generation covers two months, and the adults are on the wing throughout November. As a rule, however, ripe beans, in which larvae in various instars are present, are soon harvested, shelled and stored, and the adults subsequently emerge in the storehouses. Hibernation rarely takes place in the field. The beetles are carried to the fields with the seeds during the sowing period, which in Abkhazia continues from February to the end of October. *P. vulgaris* and *P. multiflorus* are the preferred food-plants, but other leguminous plants, a list of

which is given, may also be attacked either in the field or store. Immune plants include soy beans, peas and *Vigna sesquipedalis*.

B. obtectus may occur at altitudes up to 1,200 ft. within 12½ miles of the sea. The local climatic conditions and the practice of sowing beans during 4–5 consecutive months favour its development, and there are practically no natural enemies and diseases. Infestation is not likely to spread to northern areas, as all stages were killed by exposure to —1°C. [30·2°F.] for a month, and by a mean temperature of—4°C. [24·8°F.] with fluctuations from 0 to —7°C. [32–19·4°F.] in two weeks.

As beans are only slightly infested during autumn in the field, but become badly infested in the storehouse by spring, the seeds should be fumigated in autumn soon after the crop has been harvested. During the harvest infested beans may be separated from healthy ones, as they can be easily distinguished by the slits in the rib on the back of the pods and by cracks. Late sown beans and creeping varieties that develop slowly are more heavily infested than the early sown, rapidly maturing, or bush varieties. Infestation is lowest in beans that have been gathered before the pods begin to crack. The larvae and pupae are killed if the infested seeds are sown in damp soil. If the soil is dry, young adults emerging from the seeds can make their way to the surface from a depth of 2 ins.

[Mevzos (N.).] **Мевзос (Н.). Cochlidiidae (Limacodidae) injurious to Fruit Trees.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 131–134, 2 refs. Leningrad, 1935.

Of the 13 species of Limacodids that have been recorded from the Russian Far East, those that damage fruit trees are *Monema* (*Miresa*) *flavescens*, Wlk., *Miresa flavidorsalis*, Stgr., *Parasa hilarata*, Stgr., *P. sinica*, Moore, and *P. consocia*, Wlk. The larvae, cocoons, pupae and adults of these five species are described, and notes on their distribution are given. Plum, young apples and pears in nurseries and black currant are most severely injured. Young trees exposed to the sun are preferred, and very few larvae are found on old, shady trees. Various deciduous trees and bushes are also defoliated. The hairs of the larvae irritate the skin. The adults oviposit on the lower surface of the leaves in July, and the larvae begin to appear about the middle of the month. For a long time they live gregariously and at first only scrape the leaves, but later they destroy all the foliage. In August they are parasitised by Tachinids, which develop inside their cocoons. Young larvae of *Miresa* are attacked by a Braconid, and the cocoons of *M. flavescens* are often pecked out by birds. The larvae hibernate in cocoons, which they spin in the second half of September and in October. They pupate in the following June. The cocoons of *M. flavescens* and *P. hilarata* are usually found on thin twigs, and those of *M. flavidorsalis* on the soil under fallen foliage. The cocoon of *P. sinica* is attached to a leaf, with which it eventually drops to the ground.

[Dobrovol'skiĭ (B.).] **Добровольский (Б.). A Contribution to the Method of studying Soil Pests.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 144–146. Leningrad, 1935.

A method of marking larvae has been devised as an aid to studying the bionomics of such soil-inhabiting pests as Elaterids, Tenebrionids

and Lamellicorns. Freshly collected larvae are placed in petri dishes containing earth. Each is held in position under a lens by padded forceps and is pricked in the last segment of the body, or, if it is a Lamellicorn, in a leg, with a fine needle dipped in India ink. Only the surface of the chitinous tissue should be punctured. The small stain is visible to the naked eye, the operation does not affect the larva, and it is possible to mark individuals of the first instar. The value of this method was confirmed in a series of field experiments to determine the radius over which rape-cake is an effective bait for larvae of *Agriotes gurgistanus*, Fald., *Corymbites* (*Selatosomus*) *latus*, F., and *Podonta daghestanica*, Reitt. In each experiment the bait was placed in the soil at a depth of 4 ins., and ten marked larvae were liberated round it at the same depth. Their distance from the bait varied in the different experiments from 4 to 80 ins. The results are shown in a table. The bait was effective only within a small radius and attracted only a small percentage of the larvae.

[Varshalovich (A.).] **Варшалович (А.).** *Isorrhipis melasoides* **Lap.- Cast. a new Pest of Wood in the USSR.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 p. 147. Leningrad, 1935.

The Eucnemid, *Isorhipis melasoides*, Lap., infests beech in Azerbaijan but has not been recorded elsewhere in the Russian Union. The lower part of the trunk is usually attacked and the larvae bore in the wood, pupating in chambers close to the sapwood. In Azerbaijan, infested beeches, measuring about 4½ ft. in diameter and 82 ft. in height, were found in a mountain forest in a rather damp and shady place on a north-western slope, up to 32 pupal chambers occurring to 16 sq. ins. of the surface of the sap-wood. Larvae of various instars and young adults were found at the end of August. The infested wood is only fit for fuel, and severely injured trees are liable to be broken by wind.

[Vasil'ev (I.).] **Васильев (И.). Two new Pests of our Subtropical Cultures.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 147–149, 4 refs. Leningrad, 1935.

According to investigations in Abkhazia (Georgia) in 1933 the Psyllid, *Trioza alacris*, Flor., all stages of which are described, causes serious damage to bay (*Laurus nobilis*) in the field and nurseries. There are two generations a year. The overwintered adults oviposit in the spring on young leaves, especially at the tip of the branches. The edges of the leaves become thick and curl, forming a red or orange "false gall," inside which the nymphs hide. In Abkhazia, *T. alacris* is active from May to the end of November, and was also found on *Cinnamomum camphora*. The contents of the galls were destroyed by Syrphid larvae and to a less extent by those of Coccinellids and *Chrysopa*, and by predatory bugs. Spraying with oil emulsions or dusting could only be of value at the beginning of infestation, before the galls are formed. Fumigation of nursery stock and individual trees (under a tent) with hydrocyanic acid gas would be more effective.

Heliothrips haemorrhoidalis, Bch., was found on a number of cultivated plants in the field, including persimmon (*Diospyros kaki*) and *Prunus lusitanica*. The infested leaves turn yellow or brown and may dry up and fall. Since this thrips is an important potential pest of tea, grape-vines and *Citrus* in Abkhazia, notes on its bionomics are given from the literature.

[Poroshin (V.) & Engel'hardt (V.).] **Порошин (В.) и Энгельгардт (В.). *Pagria signata* Motsch. as a Pest of bacterial Nodules in Soy.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 p. 149. Leningrad, 1935.

Much damage to sprouting soy beans in the Russian Far East is caused in dry years by the Eumolpid, *Pagria signata*, Motsch. [*cf. R.A.E.*, A **19** 445], the larvae of which feed on the interior of the nodules on the roots, leaving the walls intact. Usually 15–30 and sometimes as many as 70–90 per cent. of the nodules are infested. During June, the eggs are laid singly in cracks in the ground, under small clumps of soil, or at the base of young soy bean plants. The young larvae make their way to the roots of the plants and penetrate singly into the nodules. The infested nodules, which can be distinguished by the entrance holes, are found from the end of June onwards. There are two generations a year and in August–September the nodules on the roots of mature plants are also attacked. The injury, in addition to interfering with the development of the plants, decreases their value in rotations as a crop for fixing nitrogen.

[Vasil'ev (I.).] **Васильев (И.). *Antigastra catalaunalis* Dup. in the Turkoman ASSR (Transcaspian Region).** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 p. 150. Leningrad, 1935.

The Pyralid, *Antigastra catalaunalis*, Dup., the biology and ecology of which are little known, was found by A. V. Ushinskiĭ in 1932 and 1933 to lessen and sometimes to destroy the crop of *Sesamum* in south-western Turkmenistan. The larvae infested all parts of the plants, but caused most damage by destroying the buds, flowers, seeds and immature seed capsules, of which last from 10 to over 30 per cent. were infested.

[Durnovo (Z. P.).] **Дурново (З. П.). The Wireworm *Corymbites sjaelandicus* Müll. as a Pest of Vegetable Garden Plants.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 p. 150, 1 ref. Leningrad, 1935.

In investigations near Moscow in 1931 on the infestation by wireworms of fields under vegetables, the larvae of *Corymbites sjaelandicus*, Müll., which has seldom been recorded as a pest, were found to cause considerable damage to cabbage and onion. It was the predominant species in peat soil in plots that had only recently been cultivated after the uprooting of alder stumps. In this soil 8–10 larvae sometimes occurred per sq. ft., whereas in clayey soil it was hardly more numerous than *Athous niger*, L., and in sandy soil, which was almost exclusively infested by *Agriotes* spp., it was practically absent.

[Durnovo (Z. P.).] **Дурново (З. П.). Sickness in *Agriotes obscurus* L. and *A. sputator* L. caused by the Fungus *Entomophthora sphaerosperma* Fress.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 151–152, 2 figs. Leningrad, 1935.

In the first week of June 1928 near Moscow, adults of *Agriotes sputator*, L., and *A. obscurus*, L., were found in large numbers on the unploughed strips of soil serving as borders between fields, and examination showed that 80 per cent. of them were attacked by the fungus, *Entomophthora sphaerosperma*. Of those that collected in green

baits in fallow land only 10 per cent. were attacked. The appearance of the infested beetles, of which 60 per cent. were *A. sputator*, is described. By mid-June the epidemic ceased in the field, but in the insectary, where it destroyed up to 30 per cent. of the beetles, it lasted until the end of the month. The development of the fungus was probably favoured by the protracted cold and damp spring, and it is possible that the infested beetles concentrated on the borders between the fields because the temperature there was somewhat higher than it was in fallow land and under the green baits.

[Ritus (T.).] **Ритус (Т.). An Instance of *Psylla mali* Försk. having partly died out in Moscow District.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 p. 153. Leningrad, 1935.

At a place in the Moscow district over 73 per cent. of the nymphs of *Psylla mali*, Schm., which is usually considered to be a cold-hardy species, were killed by a fall of temperature to a minimum of −3·6°C. [25·5°F.] on 27th April 1930. The nymphs were first noticed on the apple trees on 13th April at a mean temperature of 14·7°C. [58·5°F.] ; after that date the temperature began to decrease. Most of the dead nymphs occurred on the surface of the buds.

[Shcherbinin (N. M.).] **Щербинин (Н. М.). *Neodorcadion involvens* as a Pest in western Siberia.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 1 pp. 154–156, 2 figs. Leningrad, 1935.

Field investigations in August 1933 near Omsk to determine the cause of whitened ears in wheat showed that the larvae of the Lamiid, *Neodorcadion carinatum* var. *involvens*, Fisch., are responsible. Laboratory and small scale field experiments confirmed this observation. Usually, the stems are partly severed just above the upper tillering node, or between it and the lower node, and as a result the stems turn white, no grains form in the ears, and the plants fall to the ground. This condition of wheat is generally observed in western Siberia from mid-July, and is most common in August and early September. Wheat is occasionally attacked near the roots below the tillering node; the plant is then weakened, but does not fall. The larvae migrate from one plant to another. They have also been often recorded in association with the larvae of the Melolonthid, *Amphimallus solstitialis*, L., on fodder grasses.

[Kosobutzkiĭ (M. I.).] **Кособуцкий (М. И.). A System of Control Measures against Pests and Diseases in the Cotton-growing Regions of Central Asia.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 35–44, 9 refs. Leningrad, 1935.

This is an outline of a preliminary programme of measures against pests and diseases of cotton and lucerne in Central Asia. Only the popular names of the pests, etc., are given. The recommendations are largely based on investigations of other workers and are so arranged that individual measures are to supplement each other and are to be applied at definite periods, when the particular pest or disease is most vulnerable. Instead of giving precise dates, which local and seasonal variations would falsify, the author divides the complex of chemical and agricultural measures that should be carried out throughout the

year into groups corresponding to the four seasons. The measures should be applied systematically every year and on all the farms in the district.

[Vereshchagin (V. A.).] **Верещагин (В. А.). Susceptibility of Spring Wheat of different Sowing Terms to *Oscinosoma frit* L. Attacks in the District of western Siberia.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 45–56. Leningrad, 1935.

In investigations near Omsk during 1934 to see if early sowing protects summer wheat from infestation by *Oscinella* (*Oscinosoma*) *frit*, L., wheat was sown in experimental plots on the 28th October and 9th November 1933 and in the following spring on dates between the 26th April and 28th May. Cold weather prevailed in April and most of May, and the adults began to appear in numbers and to oviposit on wheat during the first week in June, when the wheat sown early in spring was already tillering. The summer was also cold and rainy, and oviposition and larval development were, therefore, protracted. The resulting adults were on the wing at the end of July and beginning of August, and most of the larvae of the second generation entered hibernation. The wheat tillered profusely and many additional stalks (which are of minor economic importance) were produced. Infestation was heaviest in these secondary stalks. The results of examining plants taken from the different plots are tabulated. Wheat sown late in the autumn or as early in the spring as the 26th April was hardly infested at all while it was tillering and tubing. Infestation at that stage of growth was slight in wheat sown early in May and considerable in wheat sown in the middle or at the end of May. In all sowings infestation was heavier during the period of ear formation than during the period of tillering and tubing, but this increase was almost exclusively at the expense of the unproductive secondary haulms. Later sowings were again more heavily infested than early ones.

The author thinks that the importance of *O. frit* in western Siberia has been overrated. It seems to be a permanent and serious pest in the northern and eastern parts of the region, but in the steppes and forest-steppes, where the climate is considerably drier, it would cause important damage only in unusually damp years.

[Kharitonov (Ya.).] **Харитонов (Я.). On the Injuriousness of *Phyllotreta vittula* Redt. to Spring Wheat and Barley.** [*In Russian.*] —*Plant Prot.* 1935 fasc. 2 pp. 57–64. Leningrad, 1935. (With a Summary in English.)

Near Omsk in 1931 and 1932, N. Shcherbinin found that the injury caused to young summer wheat in the two-leaf stage by *Phyllotreta vittula*, Redt., or the artificial removal of up to a half the surface of the first two leaves [*cf. R.A.E.*, A **21** 392] increased the yield of grain by 43·9–64·6 per cent. The present investigations were undertaken to test this result and to try to evaluate the economic importance of *P. vittula* near Nizhniĭ-Novgorod, where it attacks barley and summer wheat and, to a less extent, oats. Barley and two varieties of summer wheat were sown in boxes, and from a quarter to the whole of the surface area of the first and later of the second leaves was removed when they were fully grown. The effect on the development of the plants and the quantity and quality of the grain are shown in tables. Reducing

the leaf surface delayed tillering and ear formation and especially the growth of the plants, and these effects increased with the amount of leaf surface removed. The experimental and control plants, however, became fully mature about the same time, and in the case of wheat put forth the same number of ear-producing stalks, but in the case of barley the number of these stalks was reduced after the removal of half the leaf surface. The difference in the yield of grain from single experimental and control wheat plants was so small that it remained within the limits of experimental error. On the other hand, the weight of grain from single barley plants from which the first two leaves had been completely removed was 40·5 per cent. less than that from single control plants. The weight of 1,000 grains was greater in all the experimental wheat plants than in the controls, and only decreased in barley when half the leaf surface or more was removed. The weight of the dry mass of a single plant (without the weight of the grain) was in direct relation to the height of the plant, and decreased in proportion with the amount of leaf surface removed. Consequently, the experimental plants produced less straw than the controls.

In a foreword to the paper, A. Lyubishchev points out that the author and Shcherbinin used rather different methods, and that the results of neither can be accepted as conclusive.

[Romanova (V. P.).] **Романова (В. П.). Materials on Acclimatisation of *Aphelinus mali* Hald. in North Caucasus.** [*In Russian.*]—*Plant. Prot.* 1935 fasc. 2 pp. 65–76, 1 ref. Leningrad, 1935.

Work on the establishment of *Aphelinus mali*, Hald., against *Eriosoma lanigerum*, Hsm., on apple in the North Caucasus [*R.A.E.*, A **21** 632] was continued in the autumn of 1932 and on a larger scale in the following spring in two localities in the south of the region that differ considerably in climate. In one, the summer is hot and dry, and the winter cold with practically no snow, and in the other, which is at the foot of the mountains, the spring and first half of the summer are rainy, the autumn is long and warm, and the winter comparatively warm and snowy. The seasonal occurrence of *Eriosoma* in both localities, where it was abundant in orchards, many of which were neglected, is discussed. In the locality with the drier climate *Aphelinus* produced 8 complete generations, with average durations of 17–28·5 days, between 26th April and 19th October. Many larvae of the eighth generation and all those of the ninth, which hatched in October, hibernated. In the locality with the milder and damper climate, 6 complete generations were produced between 1st May and about the end of September, and larvae of the seventh and many of the sixth hibernated. In both localities hibernation began about the middle of September, and the emergence of the adults had ceased about a month later. Observations showed that the larvae enter a diapause when the temperature drops to 8–10°C. [46·4—50°F.] and the development and activity of the parasite cease if the average daily temperature is below 13°C. [55·4°F.] with a minimum of 8°C.

No hyperparasites were observed, but some presumably parasitised Aphids that were attacked by a fungus did not produce Aphelinids.

Surveys of orchards in which the parasite had been liberated showed that in the place with the drier climate, 90–100 per cent. of the Aphids were destroyed towards autumn over an area of about 500 acres, and other measures of control became unnecessary. Liberations were

made in several other places and the parasite was found to be very active. Wind played a certain part in its rapid distribution. In the place with the damper climate, the parasite was not so well established and it spread much more slowly, partly because colonies of the woolly aphis were scarce before July. Surveys in the spring showed that it had withstood the rather severe winter of 1933–34, so that it is practicable to establish further colonies in the region.

[Romanova (V.) & Il'inskaya (L.).] **Романова (В.) и Ильинская (Л.). On the Viability of *Tyroglyphus farinae* in Field Conditions.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 77–80, 4 refs. Leningrad, 1935.

Tyroglyphus farinae, DeG., was found in November 1933 in corn-shocks in a field in the northern Caucasus, and later in shocks of straw. In 1934 observations were made to see if it can survive in the field. Wheat and barley plants from seeds naturally infested with *T. farinae* and the elongated mite [*T. dimidiatus*, Herm.], and samples of the soil taken from fields where they were grown were periodically examined. It was found that about a quarter of the plots were infested. The mites occurred near the roots, but not on the green parts or the ears, of 6–8 per cent. of the plants on each. They remained in the stubble after harvest. Systematic examination showed that they migrate from the stubble to self-sown cereals and fallen grain. They occurred in samples of straw and grain from shocks of wheat left in the field, but were not numerous, possibly because of dry weather. Laboratory experiments showed that they do not survive long in dry sand even in the presence of healthy grain, whereas adults and larvae were active in damp sand as long as the grain lasted. Artificially infested seeds contained active mites after they had germinated in the soil and the plants were growing. It is not yet known if *T. farinae* can survive in the field on autumn-sown cereals.

[Karumidze (—) & Novitzkaya (T. N.).] **Карумидзе и Новицкая (Т. Н.). Tests of Insecticides to be used against *Zabrus tenebrioides* Goeze.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 81–82. Leningrad, 1935.

This is a concise account of the results of preliminary field and laboratory experiments in eastern Georgia in 1932 on the chemical control of *Zabrus tenebrioides*, Gz., attacking cereals. Larvae of the first two instars occurred in September and October, and mature ones in April and the first half of May. Pupae were present from mid-May to the beginning of June, and adults in June and the first half of July. The summer diapause occurred in the second half of July and August. In the field, dusting or spraying had little or no effect on the larvae. In the laboratory, spraying with sodium arsenite or calcium arsenite (at the rate of 3 lb. per 100 gals. water) killed 80–100 and 60–75 per cent. respectively. Dusting was rather less effective. Moist baits made of white arsenic (2 lb.), rice husks (25 lb.) and water (5 gals.) killed all the larvae except in one instance. Carbon bisulphide, applied to the soil in holes 10 ins. apart at a depth of 8–12 ins. at the rate of 2·8–3·5 oz. per 10 sq. ft. gave complete mortality, but paradichlorobenzene was not effective, probably because it did not evaporate well in damp soil.

In the laboratory dusting with calcium arsenate killed 90–100 of the adults, spraying with calcium arsenate or sodium arsenite killed 60–70, and moist baits 87. In the field, dusting or spraying with calcium arsenate or sodium arsenite killed only 60–70 per cent., and moist baits had no effect whatever, probably because the beetles stay motionless in cracks in the soil and feed on the ears of the cereals. For the most part the plants were not scorched by any of the insecticides used in the experiments.

[Kalandadze (L.) & Pataraya (Sh.).] **Каландадзе (Л.) и Патарая (Ш.). Corn Borer, as a new Pest of Tea-bush, Citrus Cultures and** *Aleurites*. [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 95–96. Leningrad, 1935.

In the summer of 1934 the shoots of tea bushes (especially the more delicate southern varieties), lemons, mandarin oranges, and, to a less extent, tung oil trees (*Aleurites*) were attacked by young larvae of *Pyrausta nubilalis*, Hb., over an area of nearly 130 acres in western Georgia. One-year-old shoots alone were damaged, the larvae boring in them and causing them to dry up or break. When the tunnels were not more than 1 or 2 mm. in diameter, the shoots gradually recovered, though the normal circulation of the sap was impeded. In *Aleurites* the infested shoots did not break off, but a sticky fluid, which eventually caused decay, exuded from the wound. The preference in food-plants shown by the larvae in the laboratory differed from that observed in the open, as they lived 27 days in the shoots of *Aleurites*, 21 in tea, 20 in lemon and 15 in mandarin. The more mature larvae, especially those of the fifth instar, abandoned the infested shoots and migrated to their usual food-plants, mostly the stems of maize, for hibernation. Investigations showed that the infestation was due to the mulching of tea, lemons and mandarins during the winter with weeds and stems of maize. Further, the larvae probably migrated to the bushes and trees from standing weeds, since plots where weeds were growing round the trees were heavily infested.

The control measures recommended include regular weeding, the collection of infested shoots, and the destruction late in the autumn and early in the spring of weeds and stems of maize in and near the plantations.

[Durnovo (Z. P.).] **Дурново (З. П.). Character of Damage caused to ripening Flax by** *Aphthona euphorbiae* **Schr.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 104–106. Leningrad, 1935.

Further investigations during 1925–28 [*cf. R.A.E.*, A **16** 412] on the infestation of flax by *Aphthona euphorbiae*, Schr., in the Moscow Department showed that early sowings are considerably less infested than late ones [*cf. loc. cit.*]. The explanation is that the early sown flax is pulled before the adults appear in large numbers, whereas late sown flax is pulled after they have become abundant, and those present on the early sown flax when it was pulled migrated to the late sown. Microscopic analysis of injured stems showed that the upper and middle parts, which are the most important ones in the production of fibre, are the most severely damaged, and many of the fibre cells become corky.

[Strel'nikov (I. D.) & Konikov (A. S.).] **Стрельников (И. Д.) и Коников (А. С.). Feeding of the Larvae of** *Loxostege sticticalis* **L. in Natural Conditions.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 107–110, 2 graphs. Leningrad, 1935. (With a Summary in English.)

In the summer of 1933 preliminary studies were made in the Kalmuik region (the former Astrakhan Government) to determine the effect of climate and microclimate on the voracity of larvae of *Loxostege sticticalis*, L. Solar radiation and the movement, humidity and temperature of the air were measured by special apparatus, the body temperature of the larvae by the thermoelectric method, and the degree of voracity by the amount of excreta ejected by individual larvae into funnel-shaped paper bags fixed to infested stems of wormwood [*Artemisia*] or orach [*Atriplex*]. The bag prevented the larva from crawling down to the base. The results of observations made over periods of 24 hours are shown in diagrams. Under direct exposure to the sun the body temperature of the larvae increases, but fluctuates according to the intensity of insolation, air temperature, wind and humidity. The temperature of the larvae was always higher than that of the air. The amount of feeding was closely related to the body temperature and decreased at night. The larvae fed most when their temperature was 30°C. [86°F.]. This temperature was reached about an hour after sunrise, as insolation increases the temperature of the larvae more quickly than that of the air. After some three hours (about 10 a.m.) the body temperature rose above 30°C., and the larvae fed less. They ceased altogether when the body temperature reached 45–47°C. [113–116·6°F.] but began again when it decreased to 31–30°C., after 3 p.m. The intensity of the feeding in the evening was 20–25 per cent. higher than in the morning, and the duration was twice as long. On cloudy days, when the body temperature of the larvae did not fluctuate much, they fed continuously all day. When two fifth-instar larvae from the same batch of eggs were placed on orach, the one kept in the sun was more voracious and consumed more food than the one kept in the shade. On the other hand, as the temperature dropped in the evening, the voracity of larvae in the sun decreased more rapidly than that of individuals in the shade. Therefore, when larvae are exposed to sunlight, their voracity does not depend directly on the temperature of the air, but fluctuates with the changes in body temperature, which in turn depends on the intensity of insolation and on a complex of microclimatic factors. The way in which the larvae feed should be taken into account in applying insecticides.

[Kobakhidze (D.).] **Кобахидзе (Д.).** *Antonina bambusae* **Mask. in Adjaristan.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 111–115. Leningrad, 1935.

Antonina bambusae, Mask., which was recorded for the first time from south-western Georgia on the Black Sea coast in 1929, causes serious damage to almost all the commercial plantations of bamboo there. The larvae and adults of both sexes are described. Colonies are formed exclusively on the nodes at the base of branches (chiefly young ones), usually under the leaf and stem scales. The leaves become yellow, and sometimes separate branches and even whole plants dry up. The honeydew produced by the scales favours the development of sooty mould (*Capnodium*). The females are viviparous. The young

remain for several days under the protective cover of the sac, but leave it on hot, sunny days. In 1933, there were two complete generations. The larvae of a third generation and many adults of the preceding generation hibernated. Owing to a late and cold spring, the larvae of the first generation did not appear before 17th May and became abundant in June–July ; those of the second occurred in numbers in September. In hot weather 63–65 days elapsed between the emergence of larvae of successive generations. Most dissected females contained 80–100 eggs, but some had 150–200. Only the larvae of the first instar can migrate to any extent ; they were able to live without food for 3 days. Experiments on the dissemination of the larvae by wind gave negative results. No parasites, predators or diseases were found.

Rhizomes for planting should be treated against possible infestation, as the scales shelter at the bases of the shoots. Better cultivation of bamboo, including the use of nitrogenous manures, is essential, and the plants should be cut down late in the autumn or in winter, when the circulation of the sap is suspended and most of the colonies of the scale consist of mature females. The felled bamboos should then be lopped outside the plantation, and the loppings should be burnt.

[Grebenshchikov (B. N.).] **Гребенщиков (Б. Н.). Physical and chemical Investigations of Extracts from Sesame Leaves.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 116–120, 2 refs. Leningrad, 1935.

Aqueous extracts of dry ground leaves of *Sesamum*, prepared by infusion or by boiling the powder, were tested in the laboratory to ascertain whether they would increase the effectiveness of insecticide sprays by raising their spreading qualities, viscosity, etc. The high viscosity of the extracts enabled them to wet leaves thoroughly. Concentrations of 0·5 and 1 per cent. put an even film over apple leaves and fruit, respectively. Leaves of cotton and apple were completely covered when a 0·5 per cent. infusion of sesame leaves was added to tobacco extracts or arsenical suspensions (in the usual concentrations). Cabbage leaves, however, were only completely covered when 0·1–0·5 per cent. of Petrov's " Contact " [*R.A.E.*, A **20** 200], which decreased the surface tension of the fluid, was added to the 0·5 per cent. sesame infusion. The addition of sesame extracts decreased the rate at which suspensions of insecticides were precipitated, if the suspension was prepared first. If, however, the extract was added directly to the insecticide, it resulted in an aggregation of the small particles of the poison into larger forms, which were precipitated quickly. Suspensions of lead arsenate prepared with a 0·5 per cent. extract of sesame, left larger quantities of the insecticide on the leaves than those prepared without it.

[Glushenkov (N.) & Limoenkov (L.).] **Глушенков (Н.) и Лимоенков (Л.). Locust Hatching Terms in Connection with vernal Conditions.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 121–124, 1 ref. Leningrad, 1935.

With a view to obtaining accurate data on the time when locusts begin to hatch in Uzbekistan, a comparison was made between meteorological conditions in various parts of the country and the appearance of the hoppers in the springs of 1932 and 1933. For the hoppers of *Dociostaurus maroccanus*, Thunb., and *D. kraussi nigrogeniculatus*,

Tarb., to hatch mean air temperatures of about 15°C. [59°F.] are sufficient if the mean air temperature remains at above 10–11°C. [50–51·8°F.] during the 15–20 days before hatching begins. The corresponding temperatures for *Calliptamus italicus*, L., appear to be 18–21°C. [64·4–69·8°F.] and 13–14°C. [55·4–57·2°F.]. The existence of this relation between mean air temperatures and the hatching of the hoppers, which is of great importance for the organisation of control, was confirmed in 1934, when, on the basis of meteorological data for the second half of February and the first three weeks of March, the approximate dates of the hatching of hoppers in various parts of Uzbekistan (details of which are given) were determined correctly.

[Mironov (N. F.).] **Миронов (Н. Ф.). Investigation of constructive Principles for Machines to be used in collecting *Anisoplia austriaca* Hrbst.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 2 pp. 125–128, 6 diagrs. Leningrad, 1935.

In the Russian Union severe damage to cereals is caused by *Anisoplia austriaca*, Hbst., and since insecticides have so far been ineffective, attempts have been made during the last few years to construct machines to collect the beetles from infested plants. Brief notes on some machines are given. They are mounted on wheels and built to sweep the ears of the plants and are thought to promise success.

[Skalov (Yu. Yu.) & Miram (É. F.).] **Скалов (Ю. Ю.) и Мирам (Э. Ф.). Injurious Grasshoppers of Tobacco Growing Areas in Crimea.** [*In Russian.*]—48 pp., 32 figs., 2 diagr., 12 refs. Yalta. All-Un. Inst. Tobacco Ind., St. Publ. Crimean A.S.S.R., 1935. (With a Summary in English).

Of the 21 species of grasshoppers that attack tobacco in the Crimea, the most injurious are *Poecilimon aj-petri*, Stsch., *P. flavescens*, H.-S., *P. bosphoricus*, Ret., *P. kusnezovi*, Miram, and *Isophya taurica*, Br. These occur on mountain slopes in the south and east of the country, protected from the cold northerly and north-easterly winds, and their migrations into the valleys are caused in spring by low temperatures, and later by the drying up of the vegetation. Damage to tobacco is caused throughout the vegetative period and reaches a maximum in mid-summer; in 1932, about 150 acres of tobacco were completely destroyed.

The best control was obtained by dusting with sodium fluosilicate, either alone or mixed with a carrier at the rate of 1 : 10 or 1 : 20, or by spraying with 1 lb. Paris green and 2 lb. lime in 48 gals. water. Dusting with Paris green scorched the plants. The need for careful records of times of hatching and egg-laying is urged.

[Predtechenskiĭ (S. A.).] **Предтеченский (С. А.). Studies on the Desert Locust (*Schistocerca gregaria* Förs k.) in Central Asia and Transcaucasus in 1929–1930.** [*In Russian.*]—*Bull. Plant Prot.* (1, Ent.) no. 11 91 pp., 6 figs. Leningrad, 1935. (With a Summary in English.)

This is a compilation of observations on the biology of *Schistocerca gregaria*, Forsk., made by a number of workers, and edited by Predtechenskiĭ. Detailed descriptions are given of the movements and breeding of locusts that invaded Central Asia and Transcaucasia from Persia in the springs of 1929 and 1930, respectively [*cf. R.A.E.*, A **20** 93].

The invading swarms, which in Central Asia moved at the rate of 9–16 miles a day, began to oviposit at once in both cultivated regions and deserts. They preferred irrigated and sandy soils, and avoided heavy clays and shifting sands. The egg-pods were laid in very dense masses and contained 60–80 eggs. Hatching, which mostly took place in June, normally occurred 15–20 days after oviposition, but a delay of 3½ months was observed when the egg-deposits were flooded. A very detailed account is given of the effect of temperature on the process of hatching. It is concluded that the behaviour of hoppers depends on daily fluctuations of temperature. In dense vegetation the smaller variations in temperature make the hoppers rather inactive, and the whole larval period may be passed in one place. At low temperatures the hoppers move by crawling and at high temperatures by leaping, the speed at which they move increasing with their age. The movement usually takes place along the lines of least resistance, and is often determined by microrelief and vegetation. The behaviour of newly moulted adults, which first appeared at the end of June, was also studied, and it was found that flights were never undertaken at temperatures below 21°C. [69·8°F.]. The southward migration occurred in late summer. Most of the locusts disappeared in August, and although a few scattered individuals of this generation remained and oviposited, the eggs apparently did not hatch.

The hoppers and adults fed only at temperatures above 23°C. [73·4°F.] and below 40°C. [104°F.]. The amount of food consumed by different stages, and the rate at which the food passes through the alimentary canal were studied, the latter by feeding hoppers on different types of food and examining excreta and the contents of the canal. The plants attacked included cotton (about 29,000 acres of which were damaged in Central Asia in 1929) and lucerne, as well as cereals, vegetable crops, apricots, cherries and many wild plants, which are enumerated.

Some experimental work was carried out on phases. Direct observations in the field showed that *solitaria* hoppers are evolved as a result of sparsely-laid egg-pods or protracted hatching, as well as in dense vegetation. A close accumulation of even a small number of hoppers always produced *ph. gregaria*.

Many invading swarms perished because they alighted on lakes and rivers. Both adults and hoppers suffered from bacterial disease, and were parasitised by larvae of the flies, *Blaesoxipha filipjevi tertia*, Rohd., *B. laticornis*, Mg., *B. lineata*, Fall., *B. monticola*, Rohd., and *Disjunctio balassogloi*, Portsch. The predators included Solpugids, species of *Vespa* and *Sphex*, Mantids, ants of the genus *Camponotus*, which attacked hoppers of the first three instars, and several species of lizards and birds.

[Predtechenskiĭ (S. A.).] **Предтеченский (С. А.). The Annual Cycle of the Desert Locust (*Schistocerca gregaria* Försk.), its Migrations and Periodicity in Persia and adjacent Countries of tropical and subtropical Asia.** [*In Russian.*]—*Bull. Plant Prot.* (1, Ent.) no. 12 135 pp., 49 figs., 2 pp. refs. Leningrad, 1935. (With a Summary in English.)

In 1930 and 1931 the author made an exhaustive study of the annual cycle of *Schistocerca gregaria*, Forsk., in Persia and of the factors determining its migrations and their routes. Some of the results have

already been noticed [*R.A.E.*, A **21** 159]. The literature on the life-cycle of this locust and its dependence on meteorological factors is reviewed, and the outbreaks in Persia and adjoining countries are described and discussed.

From a detailed analysis of the records it is concluded that during the periods of outbreaks the locust's distribution area in Asia can be divided into three main regions, which are illustrated by a map, *viz.*, southern Arabia and north-western India, where it occurs throughout the year, during which it passes through one or two generations, the invasion area, covering the greater part of Asia, where it occurs only during the warm season and produces only one generation, and finally central and north-eastern India, which may be invaded, but where no progeny is produced owing to unfavourable ecological conditions. The outbreak centres in Persia are situated in the southern coastal lowlands [*cf.* **22** 121], with sandy hills covered by xerophytic brushwood and herbaceous vegetation, and in them the beginnings of outbreaks coincide with periods of heavy rainfall.

The southern lowlands of Persia, which have a torrid climate, are the northernmost limit of the winter distribution of *Schistocerca*. The northward migration starts in February, as the maximum temperature in adjoining areas rises above 20°C. [68°F.], and continues until June. Generally the isotherms move northwards much more quickly than the swarms. Observations on the spot have shown that swarms enter Persia from Arabia across the Strait of Ormuz from the Oman peninsula, and from Nejd across south-eastern Iraq. They probably also invade Persia from British Baluchistan and from the regions further north. Invasions of Baluchistan from Persia have been recorded [*cf.* **3** 461].

The moisture required by locusts during their migrations is obtained from green plants, and so the extensive dry deserts in Persia are only crossed where they are intersected by mountain ridges, the streams from which irrigate the surrounding areas. The ranges of Elburz, Nishapur and Turbet, which cross the migration routes at right angles, sometimes form effective barriers to flight. Moreover, mountainous areas, with their diversified relief and consequently varied climatic conditions, lead to a gradual dispersal of swarms, as well as to their destruction by the rapid fluctuations of temperatures occurring at great altitudes.

Throughout Persia, *Schistocerca* has only one generation a year. The hibernating locusts remain immature until February, and maturation coincides with the winter rains ; but as all do not mature simultaneously, and as the oviposition period coincides with migrations and there is a difference of four months between the earliest and latest egg-layings, the egg-infested territory gradually extends northwards. The immature swarms of the next generation migrate during late summer in a general southerly direction, and some of them succeed in returning to the hibernation zone.

Owing to the diversity of relief and to the consequent variety of ecological and climatic conditions in Persia, the northward movement of swarms is concentrated along four main routes, which are described [*cf.* **21** 159]. The northern limits of a migration are determined not only by such factors as mountain barriers and waterless deserts, but also by the number of swarms concentrated at the initial points at the northernmost limit of the winter distribution, and on the temperature conditions under which the migrations occur ; the spread is greatest

when the swarms are numerous and the migration starts early. A detailed plan is proposed for the establishment of posts along the migration routes, systematic observations on which would give warning of the danger of swarms penetrating into U.S.S.R. territory from Persia [*loc. cit.*]. It is also suggested that the discovery of the outbreak centres, and measures to prevent the formation of initial swarms in them would lead to the diminution of the areas invaded and of the damage done by locusts.

Wilson (G. F.). *Phylloxera* **on Vines, a new British Record.**—*Proc. R. ent. Soc. Lond.* **10** pt. 1 pp. 25–28, 1 map. London, 27th June 1935.

The author records the discovery in November 1934 of the subterranean form of *Phylloxera vitifoliae*, Fitch, infesting the roots of a pot vine and an established rod in a vinery in Berkshire. As a result of infestation small galls or nodules form near the tips of the young rootlets and large swellings on the older ones and the roots. The small galls are commoner and less injurious. In January 1935, pot plants were more severely infested than established rods growing in the borders. This confirms the theory that shallow roots are more susceptible to attack than deep ones. The pest is believed to have persisted in these vineries for a number of years. The places and dates at which *Phylloxera* has been recorded in Great Britain and Ireland are shown in a map. The last record was in 1912 [*R.A.E.*, A **2** 237].

The author quotes from a letter from F. Laing about the nomenclature of this species. The specific name *vitifoliae*, Fitch, has priority over *vastatrix*, Planch. As Shimer's genus *Viteus* is a synonym of *Daktulosphaira*, Shimer, the correct name for the species is *D. vitifoliae*, Fitch, unless it is considered to come within the scope of the genus *Phylloxera*.

Böhmel (W.) & Jancke (O.). **Beitrag zur Kenntnis des Steinfruchtstechers,** *Furcipes rectirostris* **L. (Syn.** *Anthonomus druparum* **L.).** [A Contribution to the Knowledge of *Anthonomus rectirostris*, L.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 2 pp. 65–78, 1 fig., 1 pl., 14 refs. Berlin, 15th July 1935.

In 1932, *Anthonomus* (*Furcipes*) *rectirostris*, L., all stages of which are described, caused injury to cultivated cherries near Naumburg a.S. This weevil is recorded in the literature from species of *Prunus* only, but not from peach and plum. The authors observed feeding and oviposition only on cherries, especially sour cherry. All wild cherries in the experimental plots at Naumburg, except *Prunus avium*, were more or less infested, *P. padus* being the most severely attacked.

Early in August the adults ceased feeding and went into hibernation under grass and leaves beneath the trees. Maturation feeding for 3–4 weeks on young leaves and fruits occurred in spring. Oviposition began towards the end of May in the more developed fruits and lasted about 2–3 weeks. In breeding experiments an average of 13 eggs per female was observed. The first larvae were observed at the end of the oviposition period and by 10th July only those in the third instar were to be found. The larva feeds inside the stone and pupates there after making an exit hole for the adult. Pupation took place in mid-July, and the adults emerged at the end of the month.

Maturation feeding on young shoots is occasionally dangerous to quite young plants, but this would be rare. Injury to the leaves in spring and summer is unimportant, as the weevils are not very numerous. Larval infestation of the stone is equally unimportant, as the adults emerge when most varieties of cherry have been harvested and used. The worst damage is caused by maturation feeding and oviposition in the young fruits, for some fall, some turn mouldy and some fail to develop fully. Injury to 85 per cent. of the fruits was the maximum observed. The chief measure advised is jarring the weevils off the trees, but both stomach and contact poisons should be used in serious infestations.

The morphology of all stages is described.

Blunck (H.). **Methodisches zur Zucht von** *Pieris brassicae* **L.** [Methods for Breeding *P. brassicae*.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 2 pp. 78–87, 1 fig., 1 pl., 6 refs. Berlin, 15th July 1935.

This is a description of a large cage for breeding *Pieris brassicae*, L. It has double doors, glass sides, a gauze top and a second roof, made of glass, to keep off rain. It encloses suitable food-plants growing in pots and should be placed where it will get warmth and air but no draughts. Various points relating to breeding *P. brassicae* are noted.

Jancke (O.). **Ueber den Einfluss einiger Blutlaus-Bekämpfungsmittel auf die Entwicklung des Blutlausparasiten** *Aphelinus mali*. [On the Effect of some Woolly Aphis Insecticides on the Development of the Woolly Aphis Parasite, *A. mali*.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 2 pp. 96–98, 1 ref. Berlin, 15th July 1935.

The effect on *Aphelinus mali*, Hald., of insecticides used against the woolly apple aphis [*Eriosoma lanigerum*, Hsm.] has been tested in the laboratory. The results with 11 German proprietary preparations are tabulated. Tar distillates destroyed so many of the Aphelinids that if they were regularly used in winter new colonies would have to be established in the spring. Some other preparations completely destroyed the Aphid without harming the parasite.

Herold (W.). **Die Bekämpfung von Asseln in einer feuchten Wohnung.** [The Control of Woodlice in a damp Dwelling.]—*Mitt. Ges. Vorratsschutz* **11** no. 4 pp. 50–51. Berlin, July 1935.

An infestation of a damp ground-floor room in Pomerania by *Porcellio* (*Euporcellio*) *pictus*, Brdt., was cleared in about three weeks by strewing a proprietary preparation of thallium sulphate near the cracks where it sheltered.

Tempel (—). **Schädigendes Auftreten von Gabelschwanzraupen.** [An injurious Occurrence of Notodontid Larvae.]—*Kranke Pflanze* **12** no. 7–8 pp. 119–120, 1 pl. Dresden, 1935.

An infestation of one-year-old Lombardy poplars at Leipzig by *Dicranura vinula*, L., is recorded. It was checked by spraying with an arsenical. The adults of this Notodontid are on the wing from May to July and lay their eggs singly or in pairs on both sides of the leaves of poplars and willows. The larva feeds on the leaves for about six weeks

and then spins on the trunk, usually close to the ground, a hard envelope about two inches long, with particles of wood interspersed in the web. After remaining in this case for about three weeks it pupates. Hibernation occurs in the pupal stage. Woodpeckers devour the pupae. The cocoons of an Ichneumonid, *Paniscus cephalotes*, Holmgr., were found in the pupal cases, and the cocoons of another parasite, probably *Apanteles* sp., have been taken on a larva.

Musmarra (A.). **L'*Icerya purchasi*, Mask., nei ginestreti etnei.** [*I. purchasi* in the Stretches of Broom in the District of Mount Etna.] —*Riv. Fis. Mat. Sci. nat.* **8** no. 9 pp. 576–586, 1 fig. Naples, 1934. (Abstr. in *Bibliogr. ital.* 1934 (A bis) p. 286. Venice, 1935.)

The introduction of *Icerya purchasi*, Mask., and of its natural enemy [*Rodolia cardinalis*, Muls.] into Sicily are described, with an account of the spread of the scale on the eastern slope of Etna, and the need for protecting broom on lava soil is stressed.

Trajna (S.). **Un nuovo parassita del pistacchio (*Pistacia vera* L.) : il *Sinoxylon chalcographum* Panz.** (=*S. sexdentatum* Oliv.) [A new Pest of *P. vera*, *S. sexdentatum*.]—*Riv. Pat. veg.* 1934 no. 7–8 pp. 321–326, 1 pl. Pavia, 1934. (Abstr. in *Bibliogr. ital.* 1934 (A bis) p. 344. Venice, 1935.)

The Bostrychid, *Sonoxylon sexdentatum*, Ol. (*chalcographum*, Panz.), is recorded as attacking pistachio (*Pistacia vera*) in Sicily.

Dowden (P. B.). *Brachymeria intermedia* (**Nees**), **a primary Parasite, and** *B. compsilurae* (**Cwfd.**), **a secondary Parasite, of the Gypsy Moth.**—*J. agric. Res.* **50** no. 6 pp. 495–523, 5 figs., 30 refs. Washington, D.C., 1935.

These investigations were carried out in Massachusetts in 1924 and 1932–33, and in Budapest in 1929–30. The synonymy and distribution of the genus *Brachymeria* is briefly reviewed from the literature. The coldness of the climate probably accounts for the failure to establish *B. intermedia*, Nees, against the gipsy moth, *Porthetria dispar*, L., in New England. At Budapest, the parasite attacked almost any naked Lepidopterous pupae and most fresh Tachinid pupae. Hymenopterous pupae were refused, and Sarcophagid puparia seemed too hard for it to pierce. The insects from which it was reared in the laboratory included *Barathra* (*Mamestra*) *brassicae*, L., *Nygmia phaeorrhoea*, Don., *Pieris brassicae*, L., *Sturmia* spp., *Compsilura concinnata*, Mg., *Tricholyga sorbillans*, Wied., and *Tachina larvarum*, L. *B. intermedia*, all the immature stages of which are described, has 3 and possibly 4 generations a year. The females overwinter, probably under the bark of dead trees in the field, but the males die. Sometimes females of the first generation hibernate successfully. The insects became active and fed a little during March and April. From eggs laid between 15th and 25th May in 50 pupae of *P. dispar* no adults were produced, but 4 were reared from eggs deposited in 7 pupae of *Vanessa xanthomelas*, Esp., on 7th June. As by this time pupae of *P. dispar* are present in the field, it is undoubtedly one of the first species attacked. Adults emerged from pupae of this moth collected in the field between 28th June and 25th July. These attacked various hosts during July,

August and September, and a second generation began to emerge in late August. Two adults of *B. intermedia* emerged between 16th and 20th September from pupae of *V. io*, L., collected in the field on 12th August. Second generation adults obtained in the laboratory at first refused to oviposit but eventually attacked some retarded gipsy moth pupae. A third generation was produced, but no eggs were laid. In New England, where pupae of *P. dispar* are not present in the field until about 5th July, *B. intermedia* would probably have time to complete its first generation on other hosts before many pupae of *P. dispar* were available. The first host pupae to be parasitised successfully in the laboratory in Massachusetts were those of *Heterocampa guttivitta*, Wlk., on 21st May. Adults of the first generation emerged between 30th June and 20th July from various hosts attacked during May and early June. Such adults would probably attack the gipsy moth pupae in the field and adults of the second generation would emerge during August and September. As first generation adults received from Europe attacked various American hosts in August and September, it is probable that adults of the second generation emerging from pupae of the American strain of *P. dispar* at this time would produce a third generation. Oviposition is briefly described. Adults throve when they were kept in cages in a cool dark place and fed on dry lump sugar and honey solution (1 : 5). Of 113 females that emerged between 22nd July and 5th August, the first died on 18th June and the last on 9th August of the following year. Pairing, the optimum condition for which is a high mid-day temperature, was encouraged when the cage was placed in sunlight for 10 minutes and then put in a shady place. Isolated females never laid more than 7 eggs a day, and 5 females caged together laid 25 or 30 eggs. Unfertilised females oviposited readily, but only males were produced. The eggs hatch in about 48 hours and the larvae begin to feed at once on the contents of the host. Although more than one egg may be laid in the same pupa, only one parasite develops. The time required for development varies with the temperature. Adults were produced in 18 days from eggs deposited on 31st July, and in 51–62 days from eggs laid on 11th September. The average length of the life-cycle is 28 days for males and 30 for females.

B. compsilurae, Cwfd., is a North American species recorded from Wisconsin, Pennsylvania, New Jersey, New York and all the New England States. It is a parasite of Tachinids only, and a list is given of those from which it has been reared together with their primary Lepidopterous hosts. It is particularly destructive to *Compsilura concinnata* and *Sturmia scutellata*, R.-D., which are introduced parasites of *P. dispar*. All stages, except the adult, are described, and the species is compared with *B. intermedia*, which it resembles in some respects. The host is attacked in the larval stage while still within the larval skin or pupa of the primary host. *B. compsilura* overwinters as a larva within the puparium of its host, and its seasonal development depends largely upon the host that it attacks, but it may readily change from one species of host to another. When it attacks *S. scutellata*, which has only one generation a year, it completes only a single generation, the adults of which emerge from mid-June to mid-July. Pupae of *P. dispar* are present in the field at this time, and larvae of *Sturmia* may be attacked from about mid-July to mid-August. When *C. concinnata* is the host, adults of the overwintering generation emerge between 1st and 20th June. The first hosts attacked in the

field are probably larvae of *C. concinnata* developing in those of *Stilpnotia salicis*, L., or *P. dispar*, which are present from about 20th June. Adults of the first generation of *Brachymeria* emerge between 21st July and 1st August. In the laboratory they attacked *C. concinnata* developing in *Hyphantria cunea*, Dru., and *Euchaetias egle*, Dru., between 29th July and 12th August and a second generation appeared between 28th August and 8th September. Females of this generation attacked *C. concinnata* developing in *E. egle* between 6th and 13th September. All the fully grown larvae resulting from these females overwintered. In 1932 about 20 per cent. of the larvae of the first generation overwintered and about 80 per cent. of the second. Ten females laid 38–48 eggs each, never more than 12 in one day. Only males are produced by parthenogenesis. The larva hatches in about 48 hours, but does not apparently develop beyond the first instar until the host has pupated. The entire body contents of the host are eaten.

The time required for development from egg to adult depends on the condition of the host when it is attacked. If the latter is full-grown and emerges from its host in 48 hours after *Brachymeria* had oviposited, the hyperparasite develops rapidly, but if emergence does not take place for several days growth is retarded. Temperature also affects the rate of development, though when host larvae were attacked during June, July and August it showed no great variation in the laboratory. Males developed in 23–38 days and females in 25–31. The average life of adults emerging in June was 40 days for females and 49 for males. Individuals that were kept in a cool, dark place lived much longer; one male lived for 121 days and one female for 140. The degree of parasitism by *B. compsilurae* could not be estimated accurately, as it is difficult to collect host puparia in the field. In spite of heavy hyperparasitism, both *C. concinnata* and *S. scutellata* have continued to maintain themselves. The only known factor that limits the increase of *B. compsilurae* in North America is the presence of a tertiary parasite, *Monodontomerus aereus*, Wlk., which attacks it when it is a parasite of *C. concinnata* in *N. phaeorrhoea*.

Alvarado (J. A.). **Tratado de caficultura practica.** [A Treatise on practical Coffee Growing.]—Super Roy. 8vo, 524 pp., 182 figs., 4 pp. refs. Guatemala, The author, July 1935.

This book is intended for planters and includes a section (pp. 361–489) on insect and other pests of coffee that occur or are likely to occur in Guatemala. A brief account is given of the characters and biology of each species, the injury it does and the measures for its control. Another section (pp. 490–511) deals with natural enemies of the pests.

Ferrière (C.). **Notes on some bred exotic Eupelmidae (Hym. Chalc.).** —*Stylops* **4** pt. 7 pp. 145–153, 6 figs. London, 15th July 1935.

The species dealt with include six new ones, of which *Anastatus dasyni* was reared from the eggs of *Dasynus piperis*, China (pepper bug) in the Netherlands Indies, where it has already been recorded as *Anastatus* sp. [*R.A.E.* A, **22** 60] and Malaya; and *Eupelmus curculionis* from *Lophobaris piperis*, Mshl. (pepper weevil) in the Netherlands Indies.

CHERIAN (M. C.). **Some Acarina of economic Importance.**—*Proc. Ass. econ. Biol. Coimbatore* **2** (1934) pp. 16–21. Coimbatore, 1935.

This popular account includes notes on *Paratetranychus indicus*, Hirst, which occasionally causes serious injury to *Sorghum* in various localities in Madras Presidency and has also been recorded as attacking sugar-cane. Dusting with flowers of sulphur has proved effective. *Eriophyes* (*Phytophus*) *carinatus*, Green, has been reported as attacking tea in the Nilgiri Hills.

HOFFMANN (W. E.). **Tree Borers and their Control in Kwangtung.** [*In Chinese.*]—*Lingnan agric. J.* **1** no. 1 pp. 37–59, 7 figs. Canton, December 1934. (With a Summary in English.) [Recd. July 1935.]

Brief notes are given on the chief wood-boring insects that attack fruit, shade and ornamental trees in Kwangtung. They include *Tonica niviferana*, Wlk., which seriously damages kapok, infesting the trunks of young trees in nurseries and the branches of older trees ; *Melanauster chinensis*, Forster, and *Chelidonium gibbicolle*, White, which attack *Citrus* ; *Apriona plicicollis*, Motsch., which feeds on young mulberry twigs ; *Batocera* sp., which injures mango (*Mangifera indica*) and sometimes kapok ; and *Xystrocera globosa*, Ol., which is destructive to *Albizzia lebbek*. Approved cultural measures, such as pruning, spacing, inter-cropping, etc., which are cheaper and more profitable than spraying, are recommended. Formulae for various sprays and notes on the way to apply them are given.

CONDIT (I. J.), HOFFMANN (W. E.) & WANG (H. C.). **Observations on the Culture of Oranges near Swatow, China.** [*In Chinese.*]—*Lingnan agric. J.* **1** no. 2 pp. 175–248, 34 figs., 11 refs. Canton, April 1935. (With a Summary in English).

This is a list, with brief descriptions and biological notes, of about 80 insect pests of *Citrus* in China. Recommendations for control, based on the literature, are given for the more injurious species.

GAUDIN (O.). **Sur la toxicité comparée des pyréthrines vis-à-vis des différentes classes d'animaux.**—*C. R. Acad. Sci. Fr.* **201** no. 5 pp. 356–357, 1 ref. Paris, 1935.

In these experiments, emulsions containing a known quantity of pyrethrins were injected into the body cavity and the average fatal dose per kg. weight of the animal was calculated. Although a fairly weak dose was enough to paralyse insects, a high dose was required to kill them. *Blaps requieni*, Sol., was killed by 30–40 mg. per kg.

METALNIKOV (S.) & MENG (L. Y.). **Utilisation des microbes contre les courtillières.**—*C. R. Acad. Sci. Fr.* **201** no. 5 pp. 367–368. Paris, 1935.

An examination of the blood of numbers of *Gryllotalpa gryllotalpa*, L. (*vulgaris*, Latr.) that had died in the laboratory showed mortality to be due to two organisms, which the authors describe as *Bacillus gryllotalpae*, sp. n., and *Bacterium gryllotalpae*, sp. n. When the crickets were

fed on a drop of a suspension of either organism alone, or of the two together, they were killed in 2–3 days. Since *Bacillus gryllotalpae* is sporogenic, the insects may become infected from the excreta or decomposing bodies of infected individuals in the soil. It is suggested that these bacteria might be used for control of the mole-cricket.

ROARK (R. C.). **What is Cubé ?**—*Soap* **11** no. 4 pp. 95, 97, 99. New York, April 1935.

The following is the author's summary : From a review of the opinions of experts it is evident that " cubé " is a word used by the natives of Peru to designate any plant having fish-poisoning properties, but that the species regarded as most powerful and the one most commonly cultivated is *Lonchocarpus nicou*. This same species is called timbo in Brazil, nekoe in Dutch Guiana, nicou in French Guiana, haiari in British Guiana and barbasco in those parts of Spanish America where it grows. The terms timbo and barbasco are also applied to many other fish poisoning plants, and the terms nekoe and haiari are also applied to species of *Lonchocarpus* other than *nicou*.

SNODGRASS (R. E.). **Principles of Insect Morphology.**—Demy 8vo, ix+667 pp., 319 figs. New York & London, McGraw-Hill Pubg. Co. Ltd., 1935. Price 36*s*.

The first chapter of this text-book deals with the evolution of structural modifications in insects and from this viewpoint treats of the more important structural features of lower orders such as the Annelida and the Onychophora, and of the major groups of the Arthropoda. The second chapter discusses the building up of the fundamental organisation and development of an insect on evidence derived from embryology and from a study of the adult structure of other Arthropods and lower orders. Each subsequent chapter attempts to give a coherent morphological view of the fundamental nature and the apparent evolution of a particular group of organs or associated structures. Although the author admits that many of the generalisations set down may soon be modified or superseded, they may induce critical students to make a wider and more thorough study of the problems of insect morphology. The chapters deal in detail with the internal and external structures of the insect and the nervous and respiratory systems. Glossaries of definitions appended to them contain the German equivalents of many of the English and Latinised technical names in general use. A special effort has been made to conform to the anatomical terminology of Hermann Weber's Lehrbuch der Entomologie and Imms's General Textbook of Entomology [*cf. R.A.E.*, A **22** 231]. A bibliography and an index to technical terms are appended.

DAVIES (C.) & SMYTH-HOMEWOOD (G. R. B.). **Investigations on Machinery used in Spraying. Part II. Nozzles.**—*J. S.-E. agric. Coll. Wye* **36** pp. 62–85, 7 figs., 2 refs. Wye, Kent, July 1935.

The following is based on the authors' summary : In continuation of a scheme to improve apparatus for applying sprays and dusts against insects and fungi on fruit trees [*R.A.E.*, A **22** 511], a method to determine the surface area covered by a spray fluid, based on a technique already noticed [**22** 516], was tested in the field under commercial conditions. An average cover of about 78 per cent. was

obtained. The uniformity and degree of atomisation of the deposit was also calculated, and the spray cover efficiency (based on the area covered, degree of atomisation and uniformity) averaged 62 per cent. In further field experiments with varying pressures and with different types and arrangements of nozzles the cover efficiency ranged from 60 to nearly 92 per cent. A number of nozzles were tested in the laboratory, and the methods used in the tests are briefly described. The results were similar to those previously published [**22** 511]. Some nozzles working on the impinging jet principle were tested. The advantages and disadvantages of the grouping of nozzles on one lance are discussed, and some suggestions are made for improving the arrangement of these clusters.

Austin (M. D.), Jary (S. G.) & Martin (H.). **Studies on the ovicidal Action of Winter Washes—1934 Trials.**—*J. S.-E. agric. Coll. Wye* **36** pp. 86–94, 5 refs. Wye, Kent, July 1935.

No consistent differences in the ovicidal properties of petroleum oils used in dormant sprays on bush fruits in England have been found in comparison with the results of previous years' trials [*R.A.E.*, A **22** 515], and it appears that various oils with a viscosity between 126″ and 800″ Redwood I at 70°F. and unsulphonated residue 60–100 per cent. by volume are equally efficient at concentrations of 4 per cent. against the eggs of *Lygus pabulinus*, L. Emulsions of 3 high-boiling synthetic esters, dibutyl phthalate, methyl cyclohexanyl stearate and diamyl tartrate, the specifications of which are given, were tested as ovicides at 6, 4 and 2 per cent. concentrations. They were distinctly inferior in ovicidal properties to petroleum oils with a similar boiling range. Field trials again demonstrated the effectiveness of an emulsion containing 4 per cent. strained anthracene oil and 6 per cent. semi-refined petroleum oil as a wash against the eggs of *L. pabulinus* on red and black currants. Specifications are given on the basis of which growers purchased the necessary ingredients for the preparation of a home-made two-solution oleic acid emulsion. To prepare 100 gals. of the wash containing 10 per cent. of the mixed oils the quantities required are 4 gals. strained anthracene oil, 6 gals. semi-refined petroleum, 1 gal. oleic acid and 1½ lb. caustic soda. It was afterwards found that the percentage of anthracene oil could be reduced to 3 without loss of efficiency. The development of the foliage of one variety of red currant was retarded and the blossoms were consequently more susceptible to subsequent injury by frosts. For safety the concentration of oil should be reduced to 7·5 per cent. Black currants and another variety of red currants were unaffected and carried heavy crops, and the control of *L. pabulinus* was complete in all cases.

Austin (M. D.), Jary (S. G.) & Martin (H.). **Bordeaux Mixture—Nicotine Combinations against Aphis and Apple Scab.**—*J. S.-E. agric. Coll. Wye* **36** pp. 95–99, 8 refs. Wye, Kent, July 1935.

Trials were carried out in 1933 and 1934 in Kent to see whether the addition of an insecticide to two pre-blossom fungicide washes would control Aphids on apple well enough to make it unnecessary to use tar oil during the dormant season. *Anuraphis roseus*, Baker, was the only species sufficiently numerous to be used for observation. In the tests the pre-blossom sprays (applied at the green bud and full pink

bud stages) were followed by two post-blossom sprays. The following were the formulae used : (1) Bordeaux-sulphite lye, for which 6 pints sulphite lye (60°Tw.) were thinned down with water and added to a suspension of 12 lb. hydrated lime in about 80 gals. water, 8 gals. stock 10 per cent. copper-sulphate solution, and then 6 oz. nicotine being subsequently added and the total volume adjusted to 100 gals. with water ; (2) cottonseed oil Bordeaux, for which 6 pt. crude cottonseed oil were added with 5 gals. stock 10 per cent. copper-sulphate solution to 6 lb. hydrated lime in about 90 gals. water with the subsequent addition of 4 oz. nicotine and the emulsification of the oil by stirring, after which the volume was finally adjusted to 100 gals. ; and (3) ordinary Bordeaux (8 : 12 : 100) to which nicotine (6 oz. per 100 gals.) was added. The use of the smaller quantity of nicotine in the second spray is made possible by the marked insecticidal properties of the cottonseed oil. Trees receiving either of the first two washes showed, at the end of the second season, a lower infestation by Aphids than the unsprayed trees and those sprayed with ordinary Bordeaux-nicotine, but the degree of control was inferior to that normally given by tar distillates. The three treatments gave a marked and approximately equal reduction in scab infestation. Considerable foliage injury and fruit russeting were observed at picking time on trees that had received ordinary Bordeaux and Bordeaux-sulphite lye, but the percentage of russeted fruit and injured foliage was much lower on trees sprayed with oil-Bordeaux.

Austin (M. D.) & Jary (S. G.). **Investigations on the Insect and allied Pests of cultivated Mushrooms. IV. & V.**—*J. S.-E. agric. Coll. Wye* **36** pp. 103–110, 3 refs. Wye, Kent, July 1935.

Data on the fauna of heaps of stable manure in the process of composting for mushroom culture are recorded from samples taken in England throughout 1934, supplementing observations for the last 3 months of 1933 [*R.A.E.*, A **22** 514]. Mycetophilid flies were comparatively abundant in 1934. *Sciara fenestralis*, Zett., occurred with regularity from September to December and *S. agraria*, Felt, was also found. The larvae were much more numerous than the adults, which indicates that the latter oviposit freely in stable manure. It has been established for the first time that mushroom beds may become infested through the introduction of compost, so that precautions to exclude immigrant adults are superfluous. The larvae appeared able to survive in parts of manure heaps where temperatures of 158°F. and 162°F. were recorded.

Hypogastrura armata, Nic., which was present only in 2 samples, was the only other recognised pest occurring in any numbers. Although the springtail sometimes destroys the crop by injuring mycelium and small buttons, it sometimes occurs in large numbers without causing much damage. It is suggested that the springtails cannot penetrate far into a bed after it has been made unless they are already in the manure. The maximum temperature in the samples in which they occurred was only 99°F., and the heap was in the early stages of composting. As it has been established that they are readily killed by heat during fermentation of the manure, their presence may indicate that the beds have not heated sufficiently.

The following is taken from the authors' summary of the results obtained in experiments on the control of flies and mites in mushroom

beds: Sprays containing nicotine (1 : 1,600) were not effective against eggs of *S. fenestralis*. The addition of sulphonated lorol (1 : 4,000) did not increase their efficiency. Under the most favourable conditions nicotine sprays destroyed only 60 per cent. of the larvae. Nicotine is effective against the adults, and mushroom houses should therefore be sprayed frequently. Solutions of common salt, at a dilution of 1 : 160, showed no toxicity to the larvae. The wetting agents, sulphonated lorol and sodium γ sulphonate, applied as sprays at dilutions of 1 : 2,000, did not harm growing mushrooms.

A proprietary oil emulsion, carefully mixed and lightly sprayed on growing mushrooms, checked the injury caused by Tyroglyphid mites. A light application, when the temperature of the liquid was 104°F., did not injure the mushrooms. Warm water applied at a temperature of 110°F. was also harmless.

Hey (G. L.). **Notes on** *Cacoecia* (*Tortrix*) *podana* **Scop.**—*Ent. mon. Mag.* **71** no. 855 p. 186. London, August 1935.

Tortrix (*Cacoecia*) *podana*, Scop., has recently become common on apple and, to a slighter degree, on pear in commercial orchards in Holland, where it seems to be widely distributed. Although injury to fruit in autumn appears to be increasing, it is not so severe as in Britain [*R.A.E.*, A **23** 126]. The only other Tortricids found in numbers were *Eucosma* (*Spilonota*) *ocellana*, Schiff., and *Argyroploce variegana*, Hb., on both apple and pear. The use of lead arsenate in spring has proved inadequate to control these Tortricids in either country. Larvae of *T. podana* were found feeding inside the curled leaves of black currant in Cheshire in June 1935. It has not apparently been previously recorded from black currant.

Hey (G. L.). **A List of Parasites bred from Tortrix and Tineid Hosts.**—*Ent. mon. Mag.* **71** no. 855 pp. 186–187. London, August 1935.

This list of 18 parasites bred in Kent includes the following from the larvae of Tortricids, which were taken on apple unless otherwise stated: *Apanteles longicaudis*, Wesm., from *Batodes angustiorana*, Haw.; *Glypta nigrina*, Desv., from *Tortrix* (*Cacoecia*) *lecheana*, L.; *Hemiteles areator*, Panz., from *Hemerophila* (*Simaethis*) *pariana*, Clerck; *Pimpla* (*Itoplectis*) *alternans*, Grav., from *Eucosma* (*Spilonota*) *ocellana*, Schiff., on pear fruit; *Macrocentrus abdominalis*, F., from *Tortrix* (*Cacoecia*) *podana*, Scop., and *B. angustiorana*; *M. thoracicus*, Nees, from *Argyroploce variegana*, Hb., on both apple and pear; *Omorgus* (?) *bilobus*, Thoms., from *T. podana* and *T. diversana*, Hb.; *Pristomerus vulnerator*, Panz., from *T. podana*; *Actia pilipennis*, Fall., from *B. angustiorana*; and *Nemorilla notabilis*, Mg., from *T. podana*. *Oiorhinus pallidipalpis*, Wesm., was reared from a pupa of *H. pariana* taken as a larva on apple.

Nicol (J. M.). *Ephestia elutella* **and** *E. cautella* **infesting Cacao.**—*Bull. imp. Inst.* **33** no. 2 pp. 171–174, 4 figs., 4 refs. London, July 1935.

Miscroscopic examination of the genitalia, which are here described, is the only sure method of separating *Ephestia elutella*, Hb., and *E. cautella*, Wlk., which appear to be equally important as pests of stored

cacao. As a rule the majority of moths occurring in cacao from West Africa belong to the latter species and those from the West Indies and South America to the former.

SCHUCH (K.). **Richtlinien für die Bekämpfung des Maikäfers in der schleswig-holsteinischen Knicklandschaft unter Verwertung von Erfahrungen aus dem Flugjahr 1934.** [Rules for the Control of Cockchafers in the hedge Districts of Schleswig-Holstein on the Basis of Experience in the Flight-year 1934.]—*Anz. Schädlingsk.* **11** no. 7 pp. 73–78, 5 refs. Berlin, July 1935.

Infestations by *Melolontha* have long occurred in the hilly districts in the south-eastern part of Schleswig-Holstein and much loss is caused in fields, forests and gardens in the years of chief attack. Close-set rows of oak and beech, the preferred food-plants of the adults, separate the fields and are foci of infestation. Up to the present, systematic collection of the beetles by jarring the trees to dislodge them has proved the only useful measure and has been effectively employed in the Bienwald [*R.A.E.*, A **5** 33 ; **23** 535] and elsewhere in Germany. Not more than 16 per cent. of the beetles could be collected in Schleswig-Holstein during the 1934 campaign. The author consequently describes in detail the procedure to be followed in applying this method in 1938, the next flight-year. Some of the hedges are to be systematically destroyed, and the collection of the beetles from those that remain is to be thoroughly organised.

LEHMANN (H.). **Luzerneschädlinge. 4. Blattschädlinge.** [Lucerne Pests. 4. Leaf Pests.]—*Z. PflKrankh.* **45** no. 8 pp. 416–431, 3 figs., 14 refs. Stuttgart, 1935.

An account is given of observations on pests attacking the leaves of lucerne made in Thuringia in 1933 and 1934. The Tortricid, *Cnephasia wahlbomiana*, L., was observed in experimental plots of lucerne near Jena. This species is polyphagous ; its food-plants are recorded from the literature. The larvae appeared on lucerne in May or June and continually span the leaves together. When the inflorescences appeared they bound adjoining leaves over them and fed on the ovules. They reached full growth in about four weeks and pupated in the web, the pupal period lasting 15–17 days. When hops are attacked, it is usual to pick off the webs, but this measure could not be used where lucerne is heavily infested. Chemical control would be difficult as the larvae are sheltered. Mowing infested lucerne and at once using it as fodder are suggested. In September 1933 two larvae of *Polia* (*Mamestra*) *pisi*, L., were observed feeding on lucerne. In the laboratory they pupated on 19th and 23rd September and the adults emerged on 2nd May 1934.

The suggestion that *Agromyza nigripes*, Mg., does not occur on lucerne [*R.A.E.*, A **22** 493] was confirmed by M. Hering, who states that this species is limited to Gramineae. The Agromyzid miners of lucerne were *Liriomyza congesta*, Beck., which had one generation a year near Jena, *Agromyza* (*Domomyza*) *frontella*, Rond., and *A.* (*D.*) *nana*, Mg. [*cf. loc. cit.*]. *L. pusilla*, Mg., occurs only on *Euphorbia* spp., and records of it on lucerne are errors for *L. congesta*. *A. frontella* pupated in June and August 1933, the adults emerging in April and May 1934. Many pupae were killed by parasites. *A. nana* was about six times as

numerous as *A. frontella*. *Jaapiella medicaginis*, Rübs., is of no importance [**22** 494].

Sitona lineata, L., attacks lucerne in early spring and then peas and beans when they sprout in April, only returning to lucerne in July and August when these plants have been harvested. The adults hibernate in the lucerne fields. Contact poisons proved ineffective, but arsenical dusts were used with success [*cf.* **22** 721]. In 1934 *Hypera* (*Phytonomus*) *variabilis*, Hbst., was less abundant than in 1933 [**22** 3] and did little injury.

VOÛTE (A. D.). **Die Eientwicklung der Mehlmotte, *Ephestia kühniella* Zell., bei konstanten und schwankenden Temperaturen. Teil II.** [The Egg Development of the Flour Moth, *E. kühniella*, at constant and fluctuating Temperatures. Part II.]—*Z. angew. Ent.* **22** no. 2 pp. 165–184, 2 tables, 11 refs. Berlin, July 1935.

In the first part of these studies [*R.A.E.*, A **23** 533], it was shown that the temperature prevailing at the time of oviposition influenced the subsequent development of the egg of *Ephestia kühniella*, Zell. In studies on the effects of fluctuating temperatures, it was found that when the eggs were subjected to only one change or to several regular changes in temperature during their development, an initial temperature of 23°C. [73·4°F.] was most favourable for further development at any other temperature. The acceleration of development was greatest in experiments where eggs were subjected to two changes of temperature, when the average temperature was 22·5°C. [72·5°F.]. Whereas at a constant temperature eggs did not hatch below 10°C. [50°F.] or above 33°C. [91·4°F.], an alternation of temperatures of 5°C. [41°F.] and 35°C. [95·F°] allowed 2 per cent. to hatch.

The following conclusions were reached : Higher temperatures have an accelerating effect and lower ones a retarding effect, when development is continued at a temperature that differs from the initial one, but the extent to which development is retarded does not seem to be directly proportional to the extent of the difference in temperature. During their development the eggs can adapt themselves to certain constant temperatures. This ability is favourable to development in constant temperatures, especially if they are above the optimum, but when the eggs are placed for a further period in a yet different temperature they do not develop so well. Temperatures outside the optimum zone are injurious sooner or later, but if the injury does not exceed a certain degree it can be counteracted by the organism.

In some supplementary experiments, cultures subjected to regular alternations between 30°C. [86°F.] and 5°C. in the egg stage and then kept at 28°C. [82·4°F.] produced adults at the same time as cultures kept uninterruptedly at 28°C. In some other experiments, examples were subjected throughout their entire development to temperatures fluctuating between two points with averages of about 21°C. [69·8°F.], at which temperature, kept constant, controls were bred. The controls and the batches kept at 12–30°C. [53·6–86°F.] or less widely fluctuating temperatures all produced adults at about the same time. Total development was slower in batches kept between 10 and 32°C. [50 and 89·6°F.], the first adult emerging 10 days later than the controls. In batches kept between 8 and 34°C. [46·4 and 93·2°F.] (both

extreme temperatures in themselves precluding development) retardation was very great and only very small larvae were present 14 days after the control adults had emerged. These larvae produced adults 3 weeks after being placed at a constant temperature of 26°C. [78·8°F.].

HSIN (Chu-Sieh). **Beiträge zur Naturgeschichte der Blattwespen.** [Contributions to the Natural History of Sawflies.]—*Z. angew. Ent.* **22** no. 2 pp. 253–294, 18 figs., 5 graphs, 21 refs. Berlin, July 1935.

An account is given of investigations in Mecklenburg on the bionomics and ecology of some sawflies on pine, larch and alder. A separate section deals with anatomical observations on the extrusion of the peritrophic membrane in *Diprion* (*Lophyrus*) spp. and on the wax glands of the larva of *Eriocampa ovata*, L.

In August 1933, 900 larvae were collected in a severely infested stand of pines and the resultant pupae were kept until the adults emerged in 1934. They comprised 590 *D.* (*L.*) *frutetorum*, F., 300 *D.* (*L.*) *virens*, Klug, 25 *D.* (*L.*) *nemoralis*, Ensl., 5 *D.* (*L.*) *similis*, Htg., and 3 *D.* (*L.*) *socius*, Klug; thus the majority were species with solitary larvae [*cf. R.A.E.*, A **22** 720].

Cocoons of *D. frutetorum* placed in a thermostat at 25°C. [77°F.] in August 1933 produced adults in the same month, while those kept in a cool room produced adults from May to July 1934. The emergence curve did not correspond with the temperatures. In June and July the average life of a female was 7 days and that of a male 6–7. Oviposition followed soon after emergence. Eggs were laid singly in the basal part of each needle. The average number of eggs per female was 23·3 in the presence of males and 22·6 in their absence. Most of the eggs were laid early in the life of the adults. These figures suggest low fertility in 1934 and were confirmed by the scarcity of larvae. A description of the larva is given. Fifth-instar larvae did not feed and spun their cocoons in litter on the ground and not in the crowns of the trees. In the open the adults of a second generation emerged in August. Parthenogenesis produced males only.

Adults of the overwintered generation of *D. virens* emerged from May to July. Oviposition began not later than the day after emergence. Larvae of the first generation pupated in July. The females laid their eggs singly near the tips of old needles. Most of the eggs were laid during early adult life, the average per female being 17·3. The average life of the females was 5·7 days. The larva, which is described, had five instars.

Pines were also attacked by larvae of *D. laricis* var. *fenestratus*, Ensl., which refused to feed on larch. Adults from overwintered cocoons emerged in three brief periods beginning at the end of May, at the end of July and about mid-August. The females lived on an average for 5·8 days. Oviposition usually began on the day of emergence, one egg being laid in the middle of an old or young needle. The average number of eggs per female was 21. The larva, which is described, moulted 5 or 6 times. Some cocoons were spun in litter on the ground, but most were about an inch below the surface. Some larvae of the new generation overwintered, others after passing about 20 days in the cocoons gave rise to adults, and these oviposited, but the resulting larvae failed to develop.

Cocoons sent in during the winter of 1932–33 included those of *D. nemoralis* from which adults emerged between 15th July and 5th August 1933. Most of the cocoons of the resulting generation were used for study, and the remainder yielded only one adult, a female that emerged on 31st July 1934 and lived until 8th August. It laid 56 eggs, nearly all singly in each needle near the tip. The first larvae hatched on 13th August. The larvae are described.

Only three adults of *D. socius* were obtained. One female oviposited, laying 52 eggs at the rate of 3–8 per needle.

A table is given showing for all the above species the position in the pine needle in which the egg is laid, the number of eggs per needle and the colour of the egg. Even the application of high temperatures failed to cause emergence from cocoons in autumn, so that these solitary-living pine sawflies are heterodynamic.

The following parasites (of which some of the Hymenoptera may have been hyperparasites) emerged from some thousands of cocoons of various species of *Diprion*: the Ichneumonids, *Stylocryptus erythrogaster*, Grav., *Microcryptus basizonus*, Grav., *Henicospilus merdarius*, Grav., *Holocremnus macellator*, Thunbg. (with transitional forms to *clandestinus*, Hlmgr.), *Banchus femoralis*, Thoms., *Mesochorus fulgurans*, Hal., *Exenterus marginatorius*, F., *Hypsantyx impressus*, Grav., *Zemiophorus scutulatus*, Htg., *Lamachus lophyrorum*, Htg., *L. frutetorum*, Htg., *Ichneumon annulator*, F., *Platylabus cothurnatus*, Grav., *Exochilum circumflexum*, L., and *Campoplex adjunctus*, Först.; the Eulophid, *Microplectron fuscipennis*, Zett.; the Torymid, *Monodontomerus annulator*, Boh.; and a number of Diptera, including *Ceromasia* spp., *Diplostichus janithrix*, Htg., *Phorocera* (*Eggeria*) *fasciata*, Egg., and *Aphiochaeta* (*Megaselia*) *ruficornis*, Mg.

The sawflies found in three stands of larch were *Lygaeonematus wesmaeli*, Tischb., and *L.* (*Nematus*) *erichsoni*, Htg. (which were both numerous) and *L. laricis*, Htg. They were most abundant in the warmest and best sheltered stand and scarce in the coldest one. Adults of *L. laricis* emerged from overwintered cocoons from 28th April to 25th June, and adults of the first generation from 5th to 31st August. Even unpaired females laid nearly all their eggs on the day of emergence. One egg was laid in each needle. Paired females laid on an average 29·7 eggs each, and unpaired females 27·1. They lived for about 7 days. In the laboratory the eggs hatched in 9–15 days. At room temperature during June–July the larval stage averaged 17·8 days. At 27°C. [80·6°F.] and 70 per cent. humidity it averaged 14·6 days. The larva, which is described, moulted 4 times and pupated under the ground litter. In nature larvae of the first generation were found until early October. Cocoons placed in a thermostat at 27°C. did not produce adults in autumn, so that *L. laricis* is heterodynamic. A bug, *Picromerus bidens*, L., preyed on the larvae. From the cocoons collected in the forest, an Ichneumonid, *Polyblastus westringi*, Hlmgr., emerged in May and June, and a Tachinid, *Ptychomyia selecta*, Mg., in May.

L. wesmaeli emerged indoors between 10th May and 6th June. The females, whether paired or not, laid most of their eggs on the first day, inserting them singly in young needles. On an average they laid 13·8 eggs each and lived for 4·08 days, but contained a large number of eggs at death. The eggs hatched in about a week. Two individuals of *P. selecta* were bred from the cocoons.

A few larvae of *Platycampus duplex*, Lep., were also collected on larch. The larvae are described. Those that made cocoons at the end

of September or early in October produced adults at the end of May. Three species, *Nematinus fuscipennis*, Lep., *N. luteus*, Panz., and *Platycampus luridiventris*, Fall., were found on alder. The synonymy of *P. luridiventris* is discussed and the larva described. When at rest, it resembles a woodlouse. There appeared to be only one generation a year. The adults emerged in or after May and pupation occurred in October. The larvae of *N. fuscipennis* and *N. luteus* were seen up to autumn ; many larvae of a second generation pupated in October. Peculiarities in their morphology are described.

DINGLER (M.). **Die Bekämpfung der tierischen Spargelschädlinge.** [The Control of Animal Pests of Asparagus.]—*Z. angew. Ent.* **22** no. 2 pp. 295–330, 10 figs., 32 refs. Berlin, July 1935.

The following is taken from the summary of this paper on measures in Germany against *Crioceris asparagi*, L., *C. duodecimpunctata*, L., *Platyparea poeciloptera*, Schr., and *Agromyza* (*Melanagromyza*) *simplex*, Lw. The larvae and adults of the beetles can be satistorily controlled by such direct measures as collection, driving poultry into infested fields, spraying or, better, dusting with arsenicals, and the destruction of winter-quarters by removing and burning asparagus stumps. It is impossible to control the larvae of the flies by direct means. Using some of the plants as traps for ovipositing females, covering the shoots with paper or cellophane, collecting the adults in the early morning, and placing rods smeared with adhesive among the crops are useful on a small scale. Control on a large scale comprises the extension of the harvesting time up to the end of the flight period, the use of protective crops to shield the asparagus plants, chemical control early in the morning by means of a rapid contact poison, and the prompt removal of the infested stems or stumps. A nicotine dust poison was found effective.

Occasional pests of asparagus include *Anomala* (*Phyllopertha*) *horticola*, L., *A. aenea*, DeG., *Cneorrhinus* (*Philopedon*) *plagiatus*, Schall, *Agrotis pronuba*, L., *Polia* (*Mamestra*) *oleracea*, L., and *Calocampa exoleta*, L., which occur above ground and may all be controlled by the stomach poisons used against *Crioceris*, and *Hypopta caestrum*, Hb., Lamellicorn larvae, wireworms, and *Gryllotalpa gryllotalpa*, L. (*vulgaris* Latr.), for which the usual measures are recommended.

TUNBLAD (B). **Skadedjur i Sverige åren 1933–1934.** [Pests in Sweden during 1933–1934.]—*Medd. Växtskyddsanst.* no. 12, 31 pp., 10 figs., 14 refs. Stockholm, 1935.

The more important agricultural pests observed in Sweden during the years 1933 and 1934 are briefly reviewed and records are given of Myriapods and mites and of about 160 species of insects, arranged under their Orders. Notes on the control measures employed are added in some instances.

BOVEY (P.). **Observations sur le cycle évolutif de** *Laspeyresia* (*Carpocapsa*) *pomonella* **L. en Suise romande. Le vol des papillons en 1932, 1933 et 1934.**—*Bull. Murith.* **52** pp. 45–65, 4 figs., 12 graphs, 25 refs. Sion, 1935.

This is a summary of the results of a study of the times of flight of *Cydia* (*Laspeyresia*) *pomonella*, L., in certain districts in Switzerland in

1932–34. Tables show the average temperature of each month and the annual rainfall. The flight of the moth in the summer months in each district is shown graphically. Adults are on the wing for 2–3 months, even when there is no second generation. When climatic conditions are favourable, as in 1933–34, two arsenical applications, the first when the apple blossom falls and the second 3–4 weeks later, are insufficient to control the first generation. Against the second generation these sprays are practically useless, and treatments will have to be more closely related to the biological cycle.

Stearns (L. A.), MacCreary (D.) & Haden (W. R.). **Department of Entomology.**—*Bull. Delaware agric. Exp. Sta.* no. 192 (Rep. 1933–34) pp. 28–37, 1 ref. Newark, Del., May 1935.

Pests occurring in Delaware in the year ending June 1934 included *Parornix prunivorella*, Cham., on apple, *Metriona bivittata*, Say [*cf. R.A.E.*, A **21** 241], which has increased in numbers and is likely to become a significant limiting factor in the production of sweet potato, *Malacosoma americana*, F., which caused severe defoliation of shade and forest trees, and mites of the genus *Tetranychus*, a serious attack of which caused yellowish discolouration of pines. Following exceptionally cold weather in February, March and April, only 38 per cent. of the overwintering larvae of *Cydia* (*Carpocapsa*) *pomonella*, L., survived, as compared with an average of 78 per cent. for the 4 preceding years. Heavy rains in May, at the time when the moths were ovipositing, greatly reduced the number of eggs laid on apple.

None of the experimental sprays tested against *Erythroneura comes*, Say, on grape-vines was more effective than nicotine sulphate (1 : 800), which is recommended for the control of the first brood nymphs during the first week in July. For the fourth successive year only material originating in southern Delaware produced a second brood of *Conotrachelus nenuphar*, Hbst., and even there supplementary control measures, particularly the destruction of fallen peaches, have reduced this to a minimum. A marked accumulated excess of temperature accompanied by considerable deficiency in rainfall for several years, which has been more marked in southern than in northern Delaware, may account for the development of a second brood.

Simmons (P.), Barnes (D. F.), Fisher (C. K.), Donohoe (H. C.) & Fisher (C. D.). **Dried Fruit Fumigation.**—*E. 353*, 15 pp. multigraph, 6 refs. Washington, D.C., U.S. Dep. Agric., Bur. Ent., June 1935.

Developments during the past 7 years in the fumigation of dried fruits in the United States are briefly reviewed, and part of a letter is quoted to show the reservations adopted by the United States Department of Agriculture in recommending materials or processes for the fumigation of foodstuffs. Technical terms used in connection with fumigation are defined. Brief generalised notes are given on the stages of *Ephestia figulilella*, Gregson, *Plodia interpunctella*, Hb., *Oryzaephilus surinamensis*, L., and *Carpophilus hemipterus*, L. There is no evidence that the eggs of these insects are harder to kill by fumigation than the larvae. The application and properties of 11 commonly used fumigants or fumigant mixtures are dealt with. They are classified as fumigants evaporated from shallow pans placed above fruit,

fumigants released as gases from liquids under pressure, and fumigants generated where they are used. Suggestions are made for the choice of fumigants for different types of houses or containers, and a list of dealers in fumigants in California is appended.

Steiner (L. F.), Sazama (R. F.) & Fahey (J. E.). **Insecticide Tests to control the Codling Moth at the Vincennes, Indiana, Laboratory during 1934.**—*Trans. Ind. hort. Soc. 1934*, pp. 66–71. Lafayette, Ind., June 1935.

In Indiana during 1934, spray treatments, without such auxiliary measures as orchard sanitation, banding, etc., were tested against the codling moth [*Cydia pomonella*, L.]. When lead arsenate was used in the calyx spray at 3 lb. to 100 U.S. gals., in 4 cover sprays at 4 lb. and in the 5 last cover sprays at 3 lb., there were on the average 3,500 larvae and 17,000 total injuries to a tree on one variety of apple, and the residue of lead could not be reduced to the tolerance by ordinary washing methods. None of the materials tested gave satisfactory control, but 1 per cent. oil with nicotine sulphate (1 : 800) against the second brood and nicotine bentonite with summer oil against the second brood or throughout the season were as good as lead arsenate and left no objectionable residues. Washing was necessary wherever lead arsenate or cryolite was used after the first cover spray. Natural and synthetic cryolite seemed as good as lead arsenate, but reduced the size of the fruit and left residues that could not be removed by the ordinary washing methods. Cuprous cyanide (3 lb. to 100 U.S. gals.) in the calyx and cuprous cyanide (at the same rate) and oil in the cover sprays gave the best control of both infestation and " stings," but the fruit was badly russetted.

In laboratory tests, in which samples were taken from the plots before and after spraying, larvae entered fruit taken from the tops of the trees much more readily than fruit taken from the lower half. Lead and arsenic residues were nearly twice as heavy on the latter. All the materials tested had very low efficiencies against first brood larvae of *C. pomonella*. Lead arsenate had an efficiency of only 13·6 per cent. during the second half of the first-brood period in 1934 [*cf. R.A.E.*, A **20** 291]. The rapid growth of the apples early in the season probably renders the spray deposit insufficient. One or two extra cover sprays at 3–4 day intervals between the normal first and second cover sprays are therefore recommended. For the period 6th–27th June, 1934, natural cryolite and oil after a first cover spray of lead arsenate was superior to all other treatments, with cuprous cyanide and oil second and nicotine bentonite with oil third. Apart from its ovicidal effect, the addition of oil to nicotine bentonite throughout the season is justified because $1\frac{1}{4}$ lb. to 50 U.S. gals. in combination with oil gave better results than $2\frac{1}{2}$ lb. to 50 U.S. gals. without oil.

Smith (C. R.). **Occurrence of Anabasine in *Nicotiana glauca* R. Grah. (Solanaceae).**—*J. Amer. chem. Soc.* **57** p. 959. Easton, Pa, 1935.

A sample of roots of *Nicotiana glauca*, from Arizona, was found to contain about 1 per cent. anabasine, an alkaloid previously isolated from *Anabasis aphylla* [*R.A.E.*, A **20** 37, etc.], and apparently also from tobacco. Dried leaves of plants grown experimentally from seeds were also found to contain anabasine, but there was only a doubtful

trace of nicotine. The physical constants of the anabasine isolated are given and compared with those recorded by other workers in papers already noticed [**20** 37 ; **22** 728], its chemical properties are discussed and the method used in extraction is described. *N. glauca,* which grows wild in various parts of the southwest, particularly in California, is the first plant found in the United States to contain anabasine as the principal alkaloid. Anabasine compares favourably with nicotine as an insecticide for Aphids.

Hamilton (C. C.), Ed. **Entoma. A Directory of Insect Pest Control.** —102 pp. New Brunswick, N.J., Eastern Br. Amer. Ass. econ. Ent., 1935.

This directory for the United States contains lists of insecticides and materials used in them, machinery for applying insecticides, and entomological supplies and equipment, showing the firms that supply them, and of biological testing laboratories, consulting entomologists and chemists, insect pest control companies, and publishers of entomological books. Advertisements provide information that could not be given in the lists. A section on insecticides, including fumigants, gives a brief classification of the chief materials according to their action, type and specific uses, and general information on the particular groups of insects that may be controlled by the different types.

Bailey (H. L.). **Control of the Apple Maggot.**—*Bull. Vt Dep. Agric.* no. 43 pp. 8–14, 2 figs., 6 refs. Montpelier, Vt, January 1935.

In Vermont, infestation of apples by *Rhagoletis pomonella,* Walsh, is only severe in orchards that are not regularly sprayed or are near neglected trees. Very brief notes are given on its bionomics and the appearance of the various stages. The female usually has a pre-oviposition period of 7–10 days or more. Infested fruit nearly always drops prematurely. Early varieties are most seriously infested. A minimum spraying programme [*cf. R.A.E.,* A **22** 535, etc.] would consist of 2 applications of lead arsenate (2–3 lb. in 100 U.S. gals. water or fungicide spray), made 2 and 4 weeks, respectively, after the adults begin to emerge. The date of emergence is best ascertained by placing a cage over soil in which larvae from infested apples have been allowed to pupate in the previous year. If a third spray is necessary it should be applied a fortnight after the second. Calcium arsenate and hydrated lime (2–3 lb. and 6–9 lb. per 100 U.S. gals. water) in the second and third sprays or at least 3 applications of a dust of sulphur, lime and lead arsenate (80 : 10 : 10) can be substituted for lead arsenate sprays [*cf.* **22** 534]. The removal and destruction of fallen apples is important. Neglected trees near the orchard should be removed.

Turner (N.) & Friend (R. B.). **Further Experiments on Mexican Bean Beetle Control.**—*Bull. Conn. agric. Exp. Sta.* no. 371 pp. 421–452, 3 figs., 5 refs. New Haven, Conn., June 1935.

This is a summary of data on *Epilachna corrupta,* Muls., obtained in Connecticut during 1932–34 [*cf. R.A.E.,* A **22** 598 ; **23** 319, etc.]. In 1933 the yield of French beans sprayed with 3 lb. magnesium arsenate and 2 lb. casein-lime in 100 U.S. gals. water applied on 29th July and 7th August to control the second generation larvae was 49·6 per cent. more than that of unsprayed plants. In 1934 a dust of

copper sulphate, lime and calcium arsenate applied on 26th June followed by a pyrethrum dust (50 per cent. pyrethrum flowers) on 1st August was slightly more effective in reducing injury by the Coccinellid than 1 lb. magnesium arsenate and 5 lb. lime followed by a derris dust (0·6 per cent. rotenone). The calcium arsenate dust, however, produced an increase in yield of 26·7 and the magnesium arsenate dust one of 33·6 per cent. The pyrethrum and derris dusts were applied after the pods had formed and caused no injury to the foliage. All the arsenicals used occasionally caused injury to the foliage. Sprays of derris and pyrethrum caused no injury except when they were applied after magnesium arsenate; soap spreaders probably acted on the arsenical residue. The accumulation of arsenical residues on pods depended on the size of the pod at the time of application rather than on the amount of rainfall between treatment and harvest. As any arsenical applied after the pods formed left an undesirable residue, dusts of derris (rotenone content at least 0·4 per cent.) or of pyrethrum (containing at least 25 per cent. pyrethrum flowers) should be used after the blossom drops. They can be used throughout the season, as they leave no poisonous residue under normal conditions.

List of intercepted Plant Pests, 1934.—*S.R.A., B.E.P.Q.* [1934], 84 pp. Washington, D.C., U.S. Dep. Agric., Bur. Ent., July 1935.

This list of pests intercepted on imported plants and plant products in the United States, Hawaii and Porto Rico covers the period 1st July 1933 to 30th June 1934.

Service and Regulatory Announcements January-March 1934.—*S.R.A., B.E.P.Q.* no. 122, pp. 1–25. Washington, D.C., U.S. Dep. Agric., Bur. Ent., May 1935.

In addition to recent revisions and amendments to existing Quarantine Orders of the United States, which are given verbatim, plant quarantine restrictions issued by San Salvador, Mexico, Argentina and Germany are quoted (in translation) or summarised.

Brannon (L. W.). **The Effect of Magnesium Arsenate Spray applied at various Pump Pressures on the Yield of Bush Lima Beans.**—*Bull. Virginia Truck Exp. Sta.* no. 85 pp. 1197–1201. Norfolk, Va, 1st October, 1934. [Recd. August 1935.]

An experiment, the technique of which is described, was made in Virginia in 1932 to see if sprays of magnesium arsenate or the pressure at which they are applied causes such injury to the blossoms of lima beans that the yield is reduced. There were no significant differences in the yields from unsprayed beans, from beans sprayed with magnesium arsenate (1 lb. to 50 U.S. gals. water) at pressures of 150 lb., 200 lb., and 250 lb., and from beans sprayed with water alone at the same three pressures.

Walker (H. G.) & Anderson (L. D.). **Tolerance of Cabbage Seedlings to Insecticide Dips for the Control of Aphids and Cabbage Worms.**—*Bull. Virginia Truck Exp. Sta.* no. 86 pp. 1203–1210. Norfolk, Va, 1st January 1935. [Recd. August 1935.]

In tests in Virginia, cabbage seedlings infested with Aphids and Lepidopterous larvae were dipped in a number of commercial insecticides. In preliminary tests with 20 insecticides in 1931 the only

material definitely injurious to plants was a miscible oil (Scalecide) used alone and in combination with Bordeaux, though others in comparison with the best materials reduced the percentage of survival. The percentage of survival in plants dipped in pyrethrum-soap sprays and most of the nicotine-soap mixtures was a little higher than in the controls. It made little difference whether the whole plant, or only the top of it was dipped, except that Scalecide-Bordeaux was much more injurious when the whole plant was dipped. In November 1933, when a test of 12 materials was followed by a severe frost, and in the following December when 8 materials were tested during milder weather, neither Evergreen (a commercial pyrethrum spray) nor nicotine sulphate caused injury even under the most unfavourable conditions, but other commercial pyrethrum and derris mixtures, which had a tendency to injure cabbage even in mild weather, and calcium and lead arsenates caused serious injury when treatment was followed by severe frost. In the autumn of 1934, 8 materials, including nicotine sulphate at dilutions strong enough to control Aphids (1 : 400–1 : 800) and pyrethrum and derris mixtures strong enough to control both caterpillars and Aphids (1 : 400), were tested. The whole plant was dipped. The percentage of survival was higher in the treated plants than in the checks and no injury was caused. Cabbage seedlings infested with both caterpillars and Aphids should therefore be dipped in Evergreen (1½–2 pts. to 50 gals. water). Plants infested only by Aphids should be dipped in nicotine sulphate (⅔ pt. to 50 gals.). The addition of 1 qt. of nearly neutral insecticide soap will increase the wetting properties of this dip. After any treatment, the seedlings should be well drained and planted immediately.

HARTZELL (A.). **A Study of Peach Yellows and its Insect Vector.**— *Contr. Boyce Thompson Inst.* **7** no. 2 pp. 183–207, 7 figs., 34 refs. Yonkers, N.Y., 1935.

Peach yellows is confined to the eastern half of temperate North America so that its distribution in the United States does not coincide with that of peaches. There is no authentic record of it in Georgia or the States west of the Mississippi. The history of the disease, which is remarkable for great and irregular outbreaks, is reviewed, and the symptoms are described in detail. It is systemic, as its spread is not stopped by cutting off diseased branches. In addition to peach, the susceptible plants are nectarine, apricot and Japanese plum (*Prunus salicina*). Manns believes that the cultivated plum (*P. domestica*) is also not immune, though the symptoms in it are masked [*cf. R.A.E.*, A **22** 298; **23** 443].

Unsuccessful attempts to transmit the disease are analysed from the literature. It was not transmitted by means of diseased pollen or by mechanical inoculation, and it is still uncertain whether it can be transmitted through the seed. In the author's experiments infected nymphs and adults of *Macropsis trimaculata*, Fitch, the experimental vector [*cf.* **21** 192], transmitted the disease to about 16 per cent. of 86 trees exposed to them. The first symptoms appeared from 42 to 268 days after infection. Of the trees that were infected, 3·6 per cent. were one year old and 32·2 per cent. were 3 years old or more. Above 36 per cent. of trees exposed to infected insects before 23rd June and less than 10 per cent. of those exposed after that date became infected. Tests

with 47 other species of insects and mites gave negative results. The disease was transmitted experimentally by budding.

From daily records, nymphs of *M. trimaculata* appear to be present from the end of May to the end of the third week in June in New York, and the nymphal stage appears to last about 3 weeks. In 1934 adults were found in the field from 18th June until 14th August. They lived in cages for at least 27 days. There seems to be only one generation a year, and the eggs overwinter in the bark of wild plum. Oviposition scars were seen on peach twigs in cages. Nymphs and adults feed on twigs and smaller branches in preference to foliage. The small numbers and elusive habits of *M. trimaculata*, and the fact that it is normally found on plum rather than on peach, have probably delayed its detection as the vector of peach yellows.

References in the literature to the relation between the incidence of peach yellows and adjacent woodland or native vegetation are mentioned. The author has noted the association of the disease with *Prunus americana* in orchards in Pennsylvania, where a high incidence persisted after diseased peach trees had been removed. The known distribution of *M. trimaculata* roughly corresponds with that of peach yellows, though its principal food-plant, *P. americana*, extends much further southwards. The removal of wild plum from the vicinity of peach orchards combined with the usual practice of roguing diseased trees is suggested as a possible means of control.

BUCHANAN (L. L.). **A new Genus and Species of Orchid Weevils (Coleoptera, Curculionidae, Barinae).**—*Proc. Hawaii. ent. Soc.* **9** no. 1 pp. 45–48. Honolulu, July 1935.

Orchidophilus gen. n., which is described, with *O. peregrinator*, sp. n., as the type, also includes *Acythopeus aterrimus*, Waterh., *A. orchivora*, Blackb., and *A. gilvonotatus*, Barber (the distinguishing characters of which are indicated) and probably *Apotomorrhinus orchidearum*, Kolbe. All these weevils infest orchids. *O. peregrinator* has been intercepted at Washington and at Honolulu on orchids from the Philippines and has also been found in an orchid house in Oahu.

MCBRIDE (O. C.). **Response of the Mediterranean Fruit Fly to its environmental Factors.**—*Proc. Hawaii. ent. Soc.* **9** no. 1 pp. 99–108, 4 refs. Honolulu, July 1935.

An attempt is made to bring together information derived from observations on the response of *Ceratitis capitata*, Wied., to environmental factors in Hawaii, where conditions are most favourable to its rapid multiplication and spread. It attacks more than 75 species of fruits distributed throughout the Islands, and its numbers are largely determined by the quantity of suitable fruits available, which varies with the season. In observations between April 1931 and March 1933, counts of populations and climatological records were summarised from 4 experimental plots. One was an area where several varieties of *Citrus* fruits and mangos were grown at an altitude of 200 ft., and in the other 3 wild guavas grew at 250, 1,000 and 1,800 ft. respectively. Laboratory tests were made for purposes of comparison. The abundance of the fruits and the extent of infestation were estimated twice a month throughout the fruiting period.

The following is taken from the author's summary of the results obtained: At the 4 stations environmental factors measured quantitatively represented less than 66 per cent. of all the variables affecting the normal biological processes. The abundance of the fruit spread over long periods is the greatest single factor determining the fly population. Temperature affects adult activity, and decreased temperatures increase the time of development of the immature stages. The difference in mean temperatures between elevations of 250 and 1,800 ft. is sufficient to account for about 28 per cent. of the reduction in population and infestation at the higher elevation. Rainfall, accompanied by other variables, greatly affects adult activity, oviposition, feeding and longevity, percentage of fruit infestation, pupal mortality and host-fruit sequence and abundance. Humidity, like temperature, principally exerts its effect, in conjunction with lower temperatures, on the adults. Atmospheric pressure and light are of minor importance.

It appears that *C. capitata*, by feeding on the honeydew secretion from Aphids and scale insects, could survive a host-free period of above 3 months. Adults survive temperatures of 45°F. for not more than 10 days. In fruit-growing sections with summer temperatures of 70–95°F., other factors being favourable, *C. capitata* may become of economic importance, but this would depend on the population at the beginning of the fruiting season, the abundance of suitable fruits for a minimum period of 2 months and a mean temperature above 70°F.

GOLDING (F. D.). **A probable Vector of Cassava Mosaic in Southern Nigeria.**—*Trop. Agriculture* **12** no. 8 p. 215, 2 refs. Trinidad, August 1935.

In experiments in Nigeria in 1929, the author obtained no evidence that *Bemisia nigeriensis*, Corbett, transmits the mosaic of cassava. In view of Storey's work [*cf. R.A.E.*, A **22** 683] the experiments were repeated in March 1935 with larger numbers of the suspected vector. Two infected and two uninfected cuttings of bitter cassava (*Manihot utilissima*) were planted in each of two cages covered with muslin. All the plants produced leaves in 6 days, and those on the healthy ones were more advanced than those on the infected plants. Between 21st March and 8th April, 814 adults of *B. nigeriensis* collected from infected plants in the field were introduced in batches of 22–87 into one cage. By 8th April larvae were present on the leaves of both healthy and infected plants. Two young leaves of one of the healthy plants showed symptoms of mosaic on the following day. There was no sign of mosaic on the leaves of the healthy plants in the control cage.

MYERS (J. G.). **An entomological Investigation in Grenada.**—*Trop. Agriculture* **12** no. 8 pp. 216–220, 4 refs. Trinidad, August 1935.

This record is prefaced by a short outline of the general ecological conditions. The extensive planting of bananas, which was begun about December 1933, was followed in many places by severe infestation by *Cosmopolites sordidus*, Germ., which was probably spread by the importation of infested plant material. As the borer has no wild food-plants and no parasites in Grenada, the outbreaks were controlled by systematic trapping. The most important control measure is the

selection of clean planting material. Suckers are sometimes treated with 3 per cent. sulphemulsol [*cf. R.A.E.*, A **21** 220] before planting, but experiments in Jamaica have proved that this treatment is not efficient. Dead pseudostems, stumps and infested material should be gathered into a pen and converted into manure. On one estate the material was dumped into a shallow trench, where accumulated rain water drowned most of the borers, and the whole was sterilised with weekly applications of crude oil. The stumps should be cut low, and covered with a layer of soil. Pieces of split pseudostem make effective traps. There was no evidence that balisier (*Heliconia bihai*) which is botanically allied to the banana, is infested by this weevil.

Sugar-cane is at present grown in small patches separated by waste-land and other crops. *Diatraea canella*, Hmps., and *D. saccharalis*, F., infested about 42 per cent. of the stalks and 9 per cent. of the joints of representative examples of cane. They also fed on several wild grasses. None of the parasites in Grenada is of much importance. *Telonomus* (*Prophanurus*) *alecto*, Cwfd., which is recorded for the first time there, and *Trichogramma minutum*, Riley, attack the eggs; and *Microdus stigmaterus*, Cress., and *Ipobracon grenadensis*, Ashm., attack the larvae. No trace was found of *Microbracon* (*Bracon*) *femoratus*, Ashm., which has been recorded in Grenada. Of 49 larvae of *D. saccharalis*, 12 per cent. were parasitised by *M. stigmaterus*. *Tomaspis saccharina*, Dist., is widespread in Grenada from sea-level to 2,000 ft. and is occasionally and locally abundant on sugar-cane.

Among pests of cacao, thrips [*Selenothrips rubrocinctus*, Giard] was apparently less injurious than usual.

Box (H. E.). *Diatraea albicrinella* **Box, a Species new to the Trinidad Fauna.**—*Trop. Agriculture* **12** no. 8 pp. 221–222, 3 refs. Trinidad, August 1935.

Notes are given on the distribution of *Diatraea albicrinella*, Box, the larvae of which have been found boring in the stalks of *Panicum grande* in Trinidad. Larvae have also been found on sugar-cane in one locality in Brazil. Adults have been taken in other parts of Brazil, Peru and Ecuador. The appearance of the larva and adult is briefly described.

Dowson (V. H. W.). **Entomological Notes.**—*Trop. Agriculture* **12** no. 8 p. 225. Trinidad, August 1935.

Chrysomphalus dictyospermi, Morg., and *Parlatoria blanchardi*, Targ., attack date palms in Basrah, the latter being the more common. The usual method of control is to prune away infested fronds.

In experiments on the resistance of *Ephestia cautella*, Wlk., to cold, a larva was inserted in each of 100 stoned dates, which were then placed singly in corked test tubes and exposed to 35–43°F. from 14th February 1934. Between then and 25th May one tube was taken out each day and kept at room temperature. The tubes were examined on 22nd June. The longest exposure that a larva survived was 85 days. All the tubes removed between 10th March and 21st April contained dead larvae, but 5 of the larvae that were removed during the next 18 days developed into moths. One larva was parasitised, probably by *Microbracon* (*Habrobracon*) sp.

Ripley (L. B.) & Hepburn (G. A.). **Fruit-fly in Citrus : Results with Sodium Fluosilicate Bait.**—*Sci. Bull. Dep. Agric. S. Afr.* no. 143, 8 pp. Pretoria, 1935.

Investigations were made after a severe outbreak of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] on *Citrus* in the Kat River District in 1931. The female causes the worst damage to the fruit by puncturing the rind to oviposit. The oil in the rind kills some eggs before they hatch, and the larvae that survive seldom develop except in ripening fruit. A bait spray of ¼ oz. sodium fluosilicate, ½ lb. white sugar, and 1 gal. water proved better than one containing lead arsenate [*cf. R.A.E.*, A **19** 707]. Doses of from 4 to 12 oz. according to the size of tree applied as a coarse spray are recommended. The spray does not damage the foliage, and the fruit-fly feeds on it extensively for a week or more after it is applied. Counts on the trees and in the packhouse showed that 1·25 was the maximum percentage of infested fruit. Infestation in the unsprayed blocks was about twice as great as in the sprayed blocks. To determine the total insect population before and after spraying, the trees were fumigated with hydrocyanic acid gas. A few days after spraying there were 11 times as many flies in traps on the unsprayed blocks as on the sprayed ones. Traps were used throughout the season. As a guide for spray programmes, trapping during the winter is essential. Glass traps baited weekly with Clensel diluted with water to 1 in 30 are recommended. Clensel is not so attractive as pollard, but its attractiveness is less variable [*cf.* **21** 301]. In large blocks of trees 1 trap to 50 trees is sufficient, but along the edges of orchards 1 trap to 20 would be necessary. Two estates, 2 miles apart, where experiments were conducted, were invaded by great numbers of flies on 20th April and again on 1st May. The distribution of the flies throughout the traps showed from which direction the invasions came. The percentage of females with eggs decreased from 54 on 20th April to 6 in early June.

Green (E. E.). **On a Species of *Ceroplastes* (Hem. Coccidae), hitherto confused with *C. ceriferus*, Anders.**—*Stylops* **4** pt. 8 p. 180, 1 fig. London, 15th August 1935.

The adult female of *Ceroplastes pseudoceriferus*, sp. n., is described from an undetermined plant from Ceylon, and from *Azadirachta indica* and *Diospyros montana* from India. A single individual of the same species found on an imported Japanese maple in England in 1921 was recorded in error as *C. ceriferus*, Anderson [*R.A.E.*, A **9** 599].

Le Pelley (R. H.). **The Common Coffee Mealy-bug of Kenya (Hem. Coccidae).**—*Stylops* **4** pt. 8 pp. 185–188, 1 fig., 2 refs. London, 15th August 1935.

A comparison of type specimens of *Pseudococcus lilacinus*, Ckll., with a series of the mealybug that has caused considerable damage to coffee in Kenya and was provisionally identified as it [*cf. R.A.E.*, A **21** 628, etc.] has shown that the latter is a distinct species, which is here described from the female as *P. kenyae*, sp. n. This species is oviparous, whereas *P. lilacinus* has been assumed to be ovoviviparous. The eggs of *P. citri*, Risso, have a much longer period of external incubation in Kenya than those of *P. kenyae*.

PAINE (R. W.). **The Control of the Coconut Spike Moth (*Tirathaba trichogramma*, Meyr.) in Fiji.**—*Bull. Dep. Agric. Fiji* no. 18, 30 pp., 7 refs. Suva, 1935.

This is a review of the work done between 1929 and 1934 in connection with the biological control of *Tirathaba trichogramma*, Meyr., on coconut in the Fiji Islands by means of parasites introduced from Java [*cf. R.A.E.*, A **18** 617 ; **20** 604]. Information is given about liberations of *Apanteles tirathabae*, Wlkn., *Telenomus tirathabae*, Ferrière [*cf.* **20** 604 ; **21** 360] and *Erycia basifulva*, Bezzi, up to the end of 1932 [**20** 604]. In May 1933, *Erycia* was re-introduced from Java together with *Nemeritis palmaris*, Wlkn., and *Sturmia painei*, Baranov [**22** 555]. The last, which lays its eggs on fourth and fifth instar larvae of *Tirathaba*, bred readily in captivity in Java. The eggs hatch at once, and the larvae bore into the host and emerge from the prepupae after the cocoons have been made. So few adults of *Sturmia* survived the journey to Fiji that breeding was impossible. *Nemeritis* bred very readily, and 56 colonies comprising over 11,000 individuals were released. From June 1933 to September 1934, 11 generations of *Erycia* were reared in captivity. As the colonies liberated in 1931 had failed to become established, the liberation of adults in one place until recoveries had been made in the field was considered advisable. By the time that 2,700 adults had been liberated recoveries were made, indicating that colonies of not less than 1,000 individuals should be liberated in order to make certain of the insect becoming established.

By October 1934, nearly 80,000 adults of *Telenomus* and over 26,000 of *Apanteles* had been liberated on 52 islands, from 4 of which both species had been recovered. *Apanteles* has failed to spread so rapidly on other islands as it did on Suva. The percentage of parasitism on Taveuni in September 1934 ranged from 0 to 33 in various localities. On Taveuni *Telenomus* is spreading more quickly than *Apanteles*. The percentage of parasitism in 4 localities averaged 32. Over 18,000 individuals of *Erycia* were liberated on 10 islands, from 4 of which recoveries have been made. This parasite, which has been spreading steadily, promises to exercise greater control than any of the other introduced ones. Recoveries have been made from 2 of the 16 islands on which over 11,000 adults of *Nemeritis* had been liberated. It has spread less swiftly than *Erycia* but produces a higher percentage of parasitism (32) than in Java. The author estimates what effect the combined action of the parasites is likely to have on the moth within the next five years, and concludes that only the parasites that destroy the immature stages before the female flowers are badly infested will contribute much to the success of biological control.

The native parasites are *Trichogrammatoidea nana*, Zehnt., which occasionally attacks the eggs, *Meteorus trichogrammae*, Wlkn., which is parasitic on the larvae, and *Echthromorpha diversor*, Morley, which attacks the pupae. They are of no importance. *Antrocephalis renalis*, Waterst., emerged from pupae of *Tirathaba* in breeding cages in 1931, but it has never been bred from pupae collected in the field.

According to an examination of coconut flowers on Taveuni in August and September 1934 the number of female flowers destroyed by *Tirathaba* has been reduced since 1929 by 15 per cent., but the number of healthy young nuts found on the fourth open spike of the trees had only increased by 1 per cent. This may be due to the influence of climatic conditions and to a greater normal nutfall. Until the causes

of nutfall have been determined and controlled and until it is shown that there is no relation between the absence of infestation by *Tirathaba* and an increase in the natural nutfall, it cannot be claimed that the campaign has been justified.

SERRANO (F. B.). **Control of Pineapple Mealy-bug Wilt.**—*Philipp. J. Sci.* **56** no. 2 pp. 111–124, 2 pls., 4 refs. Manila, 1935.

In the Philippine Islands, *Pseudococcus brevipes*, Ckll., which is the cause of pineapple mealybug wilt [*cf. R.A.E.*, A **23** 401], may be disseminated either through infested plant material, by the ants *Pheidole megacephala*, F., and *Solenopsis geminata rufa*, Jerd., or, to a very small extent, by its own movements. Field tests in 1930 showed that it may be controlled by spraying at monthly intervals with a 1·5 per cent. soap solution, which is made more effective by adding brown pottery clay (about 0·2 per cent.) or by heating the solution to 45–54°C. [113–129·2°F.]. Although nicotine-soap solution and oil emulsion were a little more effective than the soapsuds, which destroyed 73·9 per cent. of the mealybugs, they scorched the plants. The relative effectiveness of different brands of soap is discussed.

Infested planting material was completely freed from mealybugs by being dipped in 1·5 per cent. soap solution according to the following system : stumps, 15 minutes at 51–52°C. [123·8–125·6°F.] ; suckers of about 150 gm. weight, 20 minutes at 48–49°C. [118·4–120·2° F.] ; slips of about 100 gm. weight, 35 minutes at 45–46°C. [113–114·8°F.] ; crowns of about 50 gm. weight, 50 minutes at 42–43°C. [107·6–109·4°F.] and seedlings, 60 minutes at 39–40°C. [102·2–104°F.]. The addition of brown pottery clay rendered the dipping solution more effective, and heating it to 48–49°C. more than doubled its efficiency. When tap water heated to 54–55°C. [129·2–131°F.] was substituted for the soap solution, the mealybugs survived. The results of commercial oil emulsions and vacuum fumigation in Hawaii are discussed [*cf.* **20** 27, 139].

The rapid multiplication of such enemies as *Cryptolaemus montrouzieri*, Muls., *Lobodiplosis pseudococci*, Felt, and *Conocephalus saltator*, Sauss., should be encouraged, as under ordinary conditions they are sufficient to hold the mealybugs under control. The ants, which feed on the honeydew secreted by the mealybugs, may be controlled by clean culture, surface harrowing, and pouring soapsuds into their nests. Material for new plantations should be selected from uninfested fields or should be properly treated before planting.

HOFFMANN (W. E.). **The Life History, economic Status, and Control of three injurious Leaf Beetles (Coleoptera : Chrysomelidae).**—*Lingnan Sci. J.* **14** no. 3 pp. 505–517, 10 pls., 9 refs. Canton, 1st July 1935.

Notes are given on the Chrysomelid, *Phaedon brassicae*, Baly, the Halticid, *Throscoryssa citri*, Mlk., and an unidentified Halticid in Kwangtung. All stages of these beetles are described. Larvae and adults of *P. brassicae* have been observed feeding on the leaves of radish, watercress, and *Brassica* spp. in the vicinity of Canton. The roots of one variety of *B. alboglabra* are also eaten. Pairing occurred in the daytime and also at night. The eggs are laid singly on the leaf, slightly embedded in the epidermis or midrib. Larvae that appeared in late December completed their development in 13 days. They

pupated in cells $\frac{1}{4}$ in. below the surface of the soil on 29th December, and the adults emerged 10 days later. One larva pupated in a petri dish in which there was no soil. Larvae were occasionally observed to feed on eggs of their own species. The best method of control is to collect the larvae by hand. Badly infested plants and piles of rubbish in and under which the adults hibernate should be destroyed. A few early plants may be grown as traps. When vegetables are grown on a large scale, spraying with derris is recommended.

Throscoryssa citri, Mlk., which has previously been recorded only from Assam [*cf. R.A.E.*, A **19** 649], attacks the leaves of various species of *Citrus*, particularly nursery stock. Its life-cycle in Kwangtung is longer than in Assam, and this probably accounts for the greater damage. In May 1935 bearing trees were completely defoliated. The damage done by the adults at the end of the season in skeletonising the leaves was greater than that done by the larvae. This species has also been found in Kwangsi and Fukien, but not in Formosa. In 1935 in Canton pairing adults were found as early as mid-February. The first larvae collected entered the soil at the end of February and those that entered the soil in March and early April pupated within 5–10 days. The pupal stage lasted about a week and adults emerged about mid-March when the overwintered adults were still alive.

The adults of the unidentified Halticid are very destructive to the foliage of *Citrus* in the vicinity of Canton and Swatow. The eggs are partly embedded in the upper or lower surfaces of the leaves. Eggs laid on or before 1st March hatched on 6th and 7th March. The very young larvae are usually found on the lower surface of the leaf. As many as 12 may be found on one leaf. There are probably 3 instars. Pupation usually occurs just beneath the surface of the soil, but several larvae pupated in a petri dish. During March the pupal stage requires 7–11 days, and the life-cycle occupies a month.

Both the Halticids can be controlled by collecting the eggs and adults and disturbing the soil below the trees to destroy the pupae. The larvae of an unidentified Chrysopid kill large numbers of the larvae in the Canton district. The eggs, which were found early in April, are laid on the lower surface of the leaves and hatch in 7 days. The larvae pupate in cocoons on the lower surface of the leaves, and the adults emerge in 16–19 days. A Hymenopterous parasite emerged from one cocoon collected in the field.

PENG (Peng). **Some preliminary Notes on a Citrus Bud-feeder,** *Podagricomela weisei* **Heikg.** [*In Chinese.*]—*Ent. & Phytopath.* **3** no. 13 pp. 257–261, 4 figs. Hangchow, 1935. (Abstr. in *Lingnan Sci. J.* **14** no. 3 p. 559. Canton, 1st July 1935.)

Notes are given on the bionomics and control of *Podagricomela weisei*, Heikg., the stages of which are described. The adults and especially the larvae damage the buds, young leaves and flower-buds of *Citrus* in China.

WONG (Chi-yu) & TSEOU (Keun-lee). **An Investigation on** *Locusta migratoria* **L. in Chekiang in 1934.** [*In Chinese.*]—*Ent. & Phytopath.* **3** no. 6 pp. 107–110. Hangchow, 1935. (Abstr. in *Lingnan Sci. J.* **14** no. 3 p. 565. Canton, 1st July 1935.)

An account is given of the distribution of *Locusta migratoria*, L., in Chekiang in 1934, together with statistics for the areas in which it

was found. Information is included on control measures in different districts, the type of environment favourable to oviposition, and the method of digging out the egg masses.

SHIRAIWA (H.). **Studies on Mealy Bugs infesting Pear in Japan.** [*In Japanese.*]—*Kontyû* **9** no. 2 pp. 63–75, 4 pls., 16 refs. Tokyo, July 1935. (With a Summary in English.)

Of mealybugs that infest pear in Japan, *Pseudococcus comstocki*, Kuw., is the most common. *P. kraunhiae*, Kuw., is recorded for the first time on pear, grape-vine, persimmon and orange. Brief descriptions in English are given of the adult females of *P. matsumotoi*, sp. n., from pear, walnut, fig and maple, and *P. piricola*, sp. n., from pear, apple, *Cryptomeria*, cherry, etc. Both are widely distributed in Japan.

SAKIMURA (K.). **Transportation of predaceous Coccinellids from Saipan to Bonin Islands and Formosa.**—*Kontyû* **9** no. 2 pp. 76–82, 1 fig. Tokyo, July 1935.

In Saipan Island during 1934 the most important natural enemies of mealybugs were found to be *Cryptolaemus montrouzieri*, Muls., which was predacious on *Trionymus sacchari*, Ckll., *Ferrisiana virgata*, Ckll., and several scales; *Scymnus* (*Nephus*) sp. near *bipunctatus*, Kug., on *Pseudococcus brevipes*, Ckll., *T. sacchari*, *F. virgata* and other mealybugs; *Rodolia cardinalis*, Muls., on *Icerya purchasi*, Mask.; and *Cryptogonus orbiculus* var. *nigripennis*, Wse., on various scales. A shipment of 251 adults and 211 mature larvae of *C. montrouzieri*, *Scymnus* sp., and *R. cardinalis* was dispatched in March 1934 via Yokohama to the Bonin Islands, where various mealybugs are troublesome. They were packed in 3 boxes, each having 2 sides of coarse screen and containing a tube of water, cube sugar, leaves sprayed with honey, and wood shavings. The boxes were put in a ventilated case. The larvae were placed without food in a separate compartment. The consignment was kept at room temperature during the voyage. Owing to the difficulty of getting an ample food supply the colonies died out. In July 1934 a second shipment comprising 117 adults, 162 pupae and 27 larvae of *C. montrouzieri* was received in perfect condition and liberated on two of the Bonin Islands. On one, the Coccinellid had reduced the mealybug population at the point of liberation by November and was steadily spreading.

A survey of *Pseudococcus brevipes* and its predators on pineapple in Formosa during 1932–33 showed that the Coccinellids present were too few to check the mealybug. *Scymnus* sp. near *bipunctatus* was commonly associated with other mealybugs, but seldom with *P. brevipes*. In Saipan a closely related species was abundant and kept *P. brevipes* in check on pineapple. There may be two strains of *Scymnus* sp. on these two islands, or the beetle may be affected by the way in which the pineapples are grown, for although native varieties in Formosa are grown under trees and in weedy fields, as are all pineapples in Saipan, the imported varieties are grown in open, clean fields. In September 1934, a consignment of 270 adults, 90 pupae, and 190 larvae of *Scymnus* sp. from Saipan was received in Formosa in perfect condition. In October they were being bred satisfactorily and were shortly to be liberated in the pineapple fields of southern Formosa.

KATO (M.). **On the Number of Moultings in the Larvae of** *Anthonomus bisignatus* **Roelf.** [*In Japanese.*]—*Seitaigaku Kenkyu* [Ecol. Rev.] **1** no. 2 pp. 123–128. Sendai, Japan, June 1935.

Near Sendai, *Anthonomus bisignifer*, Schenk. (*bisignatus*, Roel.) has one generation a year. The overwintered adults begin to be active in mid-April and oviposit in the buds of strawberry. After oviposition the female cuts the stem of the bud, which drops to the ground. The larvae, which have 3 instars, feed first on the pollen and then on the remaining parts. The new adults emerge in July.

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). The Control and Measurement of Humidity under experimental Conditions.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 24–32, 2 diagr., 8 refs. Leningrad, 1935.

The effect of atmospheric moisture on the development and metabolism of insects is of great importance in investigating such questions as the possibility of the establishment of pests in new regions and of acclimatising their parasites. Detailed descriptions are, therefore given of methods of controlling and measuring it in the laboratory.

[RUBTZOV (I. A.).] **Рубцов (И. А.). On the Preferendum in Locusts.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 33–38, 5 refs. Leningrad, 1935. (With a Summary in English.)

Studies by means of a modified Herter apparatus [*cf. R.A.E.*, A **22** 728] on temperature preferences in some Siberian Acridids, including *Chorthippus albomarginatus*, DeG., and *Aeropus sibiricus*, L., show that they are very unstable, varying with such factors as age, the preceding physiological state, humidity, light, hunger, etc. At a normal temperature range of between 12 and 38°C. [53·6–104·4°F.], the chief factors determining behaviour, in their order of importance, are humidity, temperature and light, the relative importance of all factors increasing as they approach the limit of their range.

[MONCHADSKIĬ (A. S.).] **Мончадский (А. С.). On the Rôle of Contact Moisture after the Winter dormant Period (Diapause) in the Corn Borer Larvae.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 39–50, 4 graphs, 12 refs. Leningrad, 1935. (With a Summary in English.)

Overwintered larvae of the European corn borer [*Pyrausta nubilalis*, Hb.] were removed from stems of hemp at the end of April, weighed and placed in test tubes at a high humidity and a temperature of 20°C. [68°F.]. It was found that on pupation, 53·6 per cent. weighed less, 4·9 per cent. weighed the same, and 41·5 per cent. weighed more than they had at the beginning of the experiment. An increase in weight of the pupa compared with that of the larva at the end of hibernation distinguishes *P. nubilalis* from a number of other insects, which lose weight from the time the larvae ceases to feed until the adult emerges, this being chiefly due to a reduction in water content. Direct observations showed that the increase of weight in *Pyrausta* is due to the absorption by the larva of water through the mouth. When kept at 100 per cent. relative humidity but without access to contact water, the larvae never increased in weight, though they could have absorbed water

through the skin or in respiration. Tests with larvae in contact with moisture for 24 hours showed that the amount of water absorbed by them is on an average inversely proportionate to their water content at the end of hibernation. In further experiments it was found that the main quantity of water is absorbed during the first 2 hours. Repeated supplementary absorptions of water were not indispensable for pupation and development under conditions of high, or even of only 70 per cent. humidity, only a short contact with water being sufficient. On the other hand, larvae kept at 100 per cent. humidity, but without contact water, gradually decreased in weight and eventually died without pupating. The high degree of cold hardiness exhibited by the overwintering larvae [*R.A.E.*, A **23** 564] is closely connected with loss of water. This dehydration is an adaptation to hibernation in stems that offer inadequate protection against low temperatures. As a result, the dehydration of the larvae towards the end of hibernation is so high that no further development can take place unless the lack of water in the organism is replenished. Absorption of water causes a decrease in cold resistance, and this is intensified by the relative increase of metabolic water in the organism as result of the intensification of hystolytis. Therefore, spring is a critical period for the larvae, and their numbers are greatly reduced by the recurrence of cold spells and by drought.

[Zhukovskiĭ (A. V.).] **Жуковский (А. В.). Determination of the Index of the Injury caused by the Swedish Fly and other Pests of the Summer Wheat during the first Period of Growth.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 91–94. Leningrad, 1935.

Investigations were carried out in 1933 and 1934 in Voronezh on the importance of *Oscinella frit*, L., and *Chaetocnema aridula*, Gyll., which are the chief pests of summer wheat. In 1933, wet weather in spring was favourable for the crop, but its development was checked by an outbreak of *Oscinella*. In 1934 the plants were affected by drought and their yield was much lower than in 1933, although *Oscinella* was practically absent and injury by *Chaetocnema* was comparatively small. In experimental plots in 1933 the early sown wheat was more resistant to *O. frit* and gave the best yield. In both years and whatever the date of sowing, injury caused by either of the pests to the main stem was the most important, often killing the plants or reducing their yield by up to 40 per cent. Infestation of one or two secondary stems either increased the yield or had no effect. It is concluded that though *Oscinella* and *Chaetocnema* decrease the yield of summer wheat under some conditions, they are not a factor that limits the cultivation of this crop in the Black Soil Zone [*cf. R.A.E.*, A **20** 347].

[Pavlov (I. F.).] **Павлов (И. Ф.). The Injury caused to Winter and Summer Wheat in the northern Part of the Central Black Soil Zone.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 95–96. Leningrad, 1935.

Oscinella frit, L., is more injurious to summer wheat in the north of the Central Black Soil Zone than in the south, as the plants tiller 2–8 days later, and the main stem alone is thus exposed to attack for a longer period. Moreover, as summer wheat in the north is only cultivated on a small scale, it acts as a trap crop and is more infested than

oats. The development of the fly is favoured by extensive cultivation of oats and the occurrence of vast areas of grasses that enable it to maintain itself when conditions in cultivated crops are unfavourable to it.

Mayetiola destructor, Say, attacks winter wheat, and to a less extent rye, both in the north and south.

Observations during the last six years show that the yield of winter and summer wheat is generally higher in the north and centre of the Black Soil Zone than in the south, which shows that *O. frit* and *M. destructor* do not prevent the cultivation of wheat on a large scale.

[Selivanova (S. N.).] **Селиванова (С. Н.). The Study of the Ecology of** *Phyllotreta cruciferae* **Goeze in the Zone of its injurious Activity.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 96–98. Leningrad, 1935.

Observations on the ecological distribution of the Chrysomelid, *Phyllotreta cruciferae*, Goeze, in a district in Voronezh where it has caused severe damage to early planted cabbage, showed that its presence depends on the occurrence of particular food-plants. It is scarce on cabbage that is planted late. The chief wild plant with which it is associated is *Koripa austriaca*, on which it invariably concentrates. Some plants, such as *Capsella bursa-pastoris*, *Cardaria droba* and *Berteroa incana*, usually serve as food for only a short period after the appearance of the adults from hibernation. Another group of plants, which include *Sisymbrium loesli*, harbour *P. cruciferae* during the whole period of vegetation, but in small numbers only, and chiefly attract *P. nigripes*, F., and *P. atra*, F.

P. cruciferae was abundant in 1933 in spite of excessive humidity, whereas *P. nigripes*, which was present in numbers in the spring, became scarce later in the summer.

[Pavlov (I. F.).] **Павлов (И. Ф.). Test of Carriers of local Importance in the Manufacture of Anabadusts.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 98–102. Leningrad, 1935.

An account is given of tests designed to find suitable carriers for anabasine sulphate dust that are available in large quantities in the Black Soil Zone. The anabasine sulphate used contained 28 per cent. of the alkaloid. In experiments against the cabbage Aphid [*Brevicoryne brassicae*, L.] the best results were 96·8 per cent. mortality in 3 days with a 4 per cent. dust in combination with a highly alkaline white clay and 95·7 with a 7 per cent. dust in combination with lime. The rate of application was 90 lb. per acre. In tests against the apple aphis [*Aphis pomi, De G.*] all the Aphids were killed in three days after the application of a 4 per cent. dust with wood ash as the carrier at the rate of 10 gm. to a 4 or 5-year-old tree. A 2 per cent. dust with wood ash or white clay killed 98·8 and 98·0 per cent. respectively. In experiments against the apple moth [*Hyponomeuta padellus malinellus*, Zell.], 91·4 per cent. of the larvae of the 4th and 5th instars were killed in the field and 100 per cent. in the laboratory within five days by a 7 and 4 per cent. dust respectively, mixed with white clay and applied at the rate of 3·5 oz. to an 8-year-old tree.

Dust mixed with wood ash came next in effectiveness. Special experiments with *A. pomi* showed that anabasine sulphate maintained its effectiveness for 24–48 hours after application, apparently irrespective of the carrier used.

[Ponomarenko (D. L.).] **Пономаренко (Д. Л.). Contribution to the Study of Wireworms in Crop Rotation.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 103–106. Leningrad, 1935.

Examination of soil samples in the spring of 1934 showed that fields in a district in the central part of the Saratov Department were heavily infested with wireworms, of which *Agriotes sputator*, L., was very much the most numerous, others, in order of abundance, being *Corymbites* (*Selatosomus*) *latus*, F., *A. gurgistanus*, Fald., and *Pedinus femoralis*, L. Contrary to the general belief, compact soil in grazing land was much less infested than the looser soil in areas of couch grass [*Agropyrum repens*] or fodder grasses overgrown by it, the abundance of the wireworms being in direct proportion to that of the couch grass. To a less extent they also concentrated on lucerne. Where cereals had been cultivated for 2 or 3 years in fields that had previously been overgrown with couch grass the numbers of wireworms had decreased by 75 per cent., and the lowest infestation (4 per sq. yd.) was in land that had been under crops for 4 years or more. Ploughing to a depth of 4–8 ins. during the hottest part of the year greatly reduced the numbers of wireworms in fallow land with close turf and was more effective than deep ploughing in the autumn or just before sowing. It is probable that the wireworms are killed by desiccation as they cannot move downwards through the dry compact surface of the turf that has been turned over by the plough.

It was found that there is no correlation between the abundance of wireworms in the soil and the percentage of cultivated plants killed by them. The rate of damage decreases with an increase in the abundance of couch grass, and in the case of summer wheat the early sown crop is injured more. The degree to which a crop was thinned by wireworms was usually almost twice as high as the ultimate loss in yield. An increase in the quantity of seed used per acre in sowing summer wheat did not reduce the loss caused by wireworms, when couch grass was abundant in the field, as in all cases infestation was slight.

[Pilyugina (O. A.).] **Пилюгина (О. А.). The Study of Wireworms in Fields under Crop Rotation on the Krasnokutsk agricultural Experiment Station.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 106–107. Leningrad, 1935.

In July–September 1934 Elaterids were three times as numerous as Tenebrionids in fields in the Department of Kharkov, where they caused considerable damage to wheat. A list of the species found is given, showing their abundance. None of them occurred in dusty soil or very moist soil, and they were less numerous in soil consisting of large lumps than in finer soil. *Agriotes sputator*, L., was the predominant species, next in abundance being *Corymbites* (*Selatosomus*) *latus*, F., the Tenebrionid, *Dasus pusillus*, F., and the Cistelid, *Omophlus proteus*, Kirsch. Summer wheat was more infested if sown early. In the second half of the summer, the larvae were concentrated at a depth of 2–7 ins. A predominance of *Polygonum convolvulus* and *Setaria viridis* in the

weeds that grew among the culitvated crops did not affect their abundance. The author believes that the destruction of couch grass [*Agropyrum repens*] is an effective agricultural control measure.

[Megalov (A. A.).] **Мегалов (А. А.). Tests of chemical Measures in the Control of Insect Pests.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 107–109. Leningrad, 1935.

A brief abstract is given of the results of experiments carried out in 1934 in Russia with various arsenicals against the larvae of grasshoppers and of the cabbage moth [*Barathra brassicae*, L.]. The tests against the latter were inconclusive, as the results in the laboratory and the field were not in agreement. In tests of dusts against the hoppers, magnesium arsenite (25·63 per cent. As_2O_3) was the only arsenical that was more effective than the standard calcium arsenite (71·68 per cent.). Good results against the second, third and fourth instars were also obtained with copper arsenite containing 17·16 or 19·06 per cent. As_2O_3.

In experiments with poisoned baits, the grasshoppers preferred bran to sawdust. In the laboratory the poisons most toxic to the second and third instars were magnesium arsenite (25·65 per cent. As_2O_3) and copper arsenite (17·16 or 19·06 per cent.). In the field, bran baits at the usual rate of 18–27 lb. per acre did not effect satisfactory control. With sawdust baits, the highest mortality (up to 77 per cent.) was obtained with calcium arsenite containing 30 per cent. As_2O_3, but when applied at rates of 45–90 and even 180 lb., these baits did not always give complete control. The author thinks it better to place the baits in small heaps close together than to broadcast them, as the heaps retain moisture for 1–2 days, and are still of value after the first 24 hours if the dry surface crust is removed. He does not, however, consider baits to be more effective against grasshoppers than sprays or dusts.

[Ponomarenko (D. A.).] **Пономаренко (Д. А.). Entomological Factors that lower the Seed Production of Lucerne.** [*In Russian.*] —*Plant Prot.* 1935 fasc. 3 pp. 109–110. Leningrad, 1935.

Repeated examinations in the spring, summer and autumn of lucerne in a central district of the Department of Saratov showed that insect pests only occurred in small numbers and caused slight damage. In first year lucerne grown for seed of the first mowing, 10 per cent. of the flower buds were injured by the Capsid, *Adelphocoris lineolatus*, Goeze, which migrated from the adjoining fields, and 17·6 per cent. of the seeds by the Eurytomid, *Bruchophagus gibbus*, Boh. The author suggests that poor crops of lucerne seed observed in this area are due to various causes other than insects.

[Pilyugina (O. A.).] **Пилюгина (О. А.). The Study of the injurious Activity of the Swedish Fly under Conditions of Irrigation.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 110–111. Leningrad, 1935.

Investigations in the Transvolga steppe in the Department of Samara in May and June 1934 showed that *Oscinella frit*, L., was scarce on summer wheat in both irrigated and non-irrigated fields. The adults appeared about mid-May when the plants were in the three-leaf phase and oviposited at the end of the month during the period of

the full tillering, so that the eggs were laid on secondary shoots. The resulting larvae occurred in the first half of June, during the period of stem formation, and were therefore only able to feed on secondary shoots. They pupated in the third week of June, and the adults emerged when the ears were forming. The second generation larvae could thus only infest the late unproductive shoots. Examination of over 6,000 stems showed that no injury occurred before irrigation, and after it less than 10 per cent. of the secondary shoots were infested. There was no decrease in crop yield. As, however, only one irrigation was applied when this study was made, further investigations are considered necessary to ascertain to what extent irrigations may alter the conditions of the Steppe region, which is unfavourable to the fly [*cf. R.A.E.*, A **22** 586].

[Kolokhova (V. A.).] **Колохова (В. А.). Poisoned Bands in the Control of the Codling Moth.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 p. 117. Leningrad, 1935.

In field experiments against the larvae of the codling moth [*Cydia pomonella*, L.] in central Russia, corrugated paper bands about 5 ins. wide smeared with a coating, 1–2 mm. thick, of 2 parts beta-naphthol dissolved in 3 parts mineral oil, were placed round the trunks of apple trees at a height of about 20 ins. from the soil. The percentage of larvae killed in the bands varied greatly with the type of oil used as the solvent, but almost all were killed when solar oil was used. The preparations did not repel the larvae, but acted as contact insecticides that scorched them. The trees, however, were not injured. The weather was dry, and in 1–2 months the coating dried and crumbled away, especially if made with one of the more effective oils.

[Mizerova (A. M.).] **Мизерова (А. М.). Chemical Control of the Apple Sucker.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 p. 117. Leningrad, 1935.

In tests in central Russia against the apple sucker [*Psylla mali*, Schm.], the most satisfactory ovicide in the laboratory was lime-sulphur (7 per cent.), which killed 76·7 per cent. of the eggs. In orchard experiments, however, the only sprays that showed any promise were two 4 per cent. mineral oil emulsions, and the percentages of dead eggs on trees sprayed with them were only 40·4 and 23·1 as compared with 10·7 on unsprayed trees. One application in the orchard of a spray of 0·1, 0·3 or 0·4 per cent. anabasine sulphate with 0·4 per cent. soft soap killed 75·4 per cent. of young nymphs and 42 per cent. of the older ones, the difference in strength of the anabasine sulphate having no effect on the rate of mortality. A second spray did not further reduce the infestation enough to justify its cost. One application of 0·75 per cent. lime-sulphur killed 79·3 per cent. of the young nymphs and 69·9 per cent. of older ones. Of insecticides against the adults, a dust of anabasine sulphate (5 per cent.) and a spray of nicotine sulphate (0·3 per cent. with soft soap) were the most effective.

[Lebedinskaya (M. G.).] **Лебединская (М. Г.). Chemical Control of young Adults of the Apple Blossom Weevil.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 pp. 117–118. Leningrad, 1935.

In experiments in central Russia with insecticides for use against young adults of the apple blossom weevil [*Anthonomus pomorum*, L.]

during the period when they are emerging in numbers from the flower buds, 82–99 per cent. mortality was obtained in cages with a dust containing 1 per cent. sodium fluosilicate. Calcium arsenite (0·2 per cent.) only killed 30–50 per cent. of the weevils when used as dust, and 32–36 per cent. when used as spray, besides scorching the plants. In the open, sodium fluosilicate also gave a high rate of mortality.

[Kovaleva (M. F.).] **Ковалева (М. Ф.). Chemical Control of the Codling Moth.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 p. 118. Leningrad, 1935.

In 1932, only the first generation of the codling moth [*Cydia pomonella*, L.] was of importance on apple in the Voronezh Department. Up to 60 per cent. of the eggs were laid on the foliage, and only a few on the fruit and shoots. About 30 per cent. of the larvae entered the fruit through the calyx. In field experiments two applications of 1 per cent. sodium fluosilicate decreased the percentage of injured fruit from 10·2 to 4·4. Two applications of a spray of Paris Green, Bordeaux mixture and anabasine sulphate reduced the percentage to 5·5. In tests on a small scale linseed-oil emulsion containing 2 per cent. anabasine sulphate killed 18 per cent. of the eggs.

[Sorogozhskaya (—).] **Сорогожская (—). Tests of Poisons in the Control of the Cherry Sawfly.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 p. 118. Leningrad, 1935.

In field experiments against the sawfly [*Caliroa limacina*, Retz.] on cherry trees in the Department of Voronezh in 1934, the sprays were applied on 5th or 6th August when most of the larvae were hatching, on 19th August when they were in the second and third instars, and on 2nd September when they were full fed. Sodium fluosilicate used in concentrations of 0·5 and 0·75 per cent. gave 31·2–70 and 51·7–84·1 per cent. control respectively. Anabasine sulphate (0·05 and 0·1 per cent.) and nicotine sulphate (0·1 per cent.) with soft soap (0·4 per cent.) acted more quickly than Paris green (0·1 per cent.) with lime (0·2 per cent.). The best time for spraying is when the young larvae hatch.

[Sorogozhskaya (—).] **Сорогожская (—). The Phenology of the principal Pests of Apple in Connection with the Phenophases of the Development of the Tree.** [*In Russian.*]—*Plant Prot.* 1935 fasc. 3 p. 118. Leningrad, 1935.

Three years' observations in Voronezh on the phenology of three different varieties of apple trees 40–45 years old, and on the seasonal occurrence of insect pests that attack them, showed that in a given year the dates on which the various phenological phases begin may vary within a limit of 1–5 days. The dates in different years depend directly on meteorological conditions. Deviations between the occurrence of the phenological phases of apple trees of a given variety and of the different stages of pests only take place in spring, whereas the calendar dates may vary by as much as two weeks in different years.

PARKER (D. L.). *Apanteles solitarius* (**Ratzeburg**), **an introduced Braconid Parasite of the Satin Moth.**—*Tech. Bull. U.S. Dep. Agric.* no. 477, 17 pp., 8 figs., 8 refs. Washington, D.C., May 1935.

Apanteles solitarius, Ratz., is an internal solitary parasite of *Stilpnotia salicis*, L., a destructive pest of poplar and willow that has spread rapidly in the New England States since its discovery in Massachusetts in 1920. From 105 cocoons of *A. solitarius* received from Budapest in 1927, 36 males and 19 females emerged. Between 1927 and 1932 adults were liberated in 6 places in New England and in 1 in Washington. All the areas were infested by *Stilpnotia* except one in Massachusetts, which was infested by *Hemerocampa leucostigma*, S. & A. The adults were liberated when the larvae of the moth had come out of hibernation and again when the eggs were hatching during the summer. Parasitised larvae were also liberated in two places. In one infested area where parasitised larvae had been placed in the field before hibernation, in order to save the labour of rearing large numbers of adults, very few of them survived the winter. The year after the first liberations the parasite was recovered from 4 localities in New England, one 15 miles from the point of liberation, and it now seems to be distributed throughout the infested area in New England. In 1933 it was sent to Canada from Massachusetts and has since been recovered there in 5 localities.

A. solitarius has been reared in the laboratory on larvae of *Porthetria dispar*, L., which was used in the rearing experiments, *Notolophus antiquus*, L., *H. leucostigma*, and *Nygmia phaeorrhoea*, Dön. It could not be induced to overwinter in the small larvae of *N. phaeorrhoea* and some other Lepidoptera. No recoveries have been made from these hosts in the field. By placing a host larva in a glass vial containing 3–5 fertilised females and substituting another for it as soon as one female had oviposited in it, 700–1,000 larvae could be parasitised in one day by 35–50 females. Pairing was induced by keeping the females in a dark place for 8–10 hours without food and then putting them into a cage containing food and males. The best conditions for pairing were a temperature of 65–70°F. and a somewhat subdued light. Only males are produced by parthenogenesis. On the average, each female laid about 400 eggs in 2–3 weeks. The largest number laid by one female in one day was 53. Eggs deposited in any part of the larva will develop. The adults lived for an average of 3–4 weeks. All stages of the parasite, which has three larval instars, and the manner of oviposition are described.

In breeding experiments with *A. solitarius* and *A. melanoscelus*, Ratz., females of each were mated with males of the other and the resulting progeny were carried through 2 generations. About 75 per cent. of the cross-bred individuals were determinable as *A. solitarius* or *A. melanoscelus*. The F_1 generations tended to resemble the female parent, and the tendency became stronger in the F_2 generation.

Larvae of *Stilpnotia* emerge from hibernation from the end of April to the latter part of May and are present in the field until early July. They begin to pupate during the last half of June, and adults appear at the end of June, the peak of emergence being in July. Oviposition is practically over by 1st August, and the eggs hatch in 12–15 days. *A. solitarius* may overwinter in the prepupal stage in its cocoon or as a first-instar larva within the hibernating host. The adults from overwintered cocoons attack host larvae emerging from hibernation in early May, and their progeny make cocoons in late May or early June. The

resulting adults emerge 7–10 days later and oviposit in the first-instar host larvae, and some of their progeny overwinter as first-instar larvae, while others issue and spin cocoons. Some of these cocoons give rise to adults in the same season and others overwinter. When the parasite overwinters as a larva, the larvae resume feeding in the host in spring and about mid-May produce adults that attack host larvae that are coming out of hibernation rather late. In the laboratory unparasitised host larvae remained in hibernation later in the spring than those containing the parasite. From 13 to 20 days after the adults of the overwintered generation have oviposited their progeny form cocoons. Some of these cocoons overwinter and from the rest adults emerge within 7–10 days. These adults oviposit in the small host larvae that are hatching in the field during the second week of July. The seasonal history from this point corresponds with that of the group produced by adults from overwintering cocoons. In the laboratory a few cocoons of the first generation did not produce adults until the following spring.

Examinations in 15 places showed that *A. solitarius* had reduced the number of overwintering larvae of *Stilpnotia* by from 14·5 to 66·7 per cent. ; in 12 the percentage was above 40. In the cocoon stage it is attacked by many of the hyperparasites that attack *A. melanoscelus* [*cf. R.A.E.*, A **15** 544]. The larvae are destroyed by *Eupteromalus nidulans* (Först.) Thoms., a parasite of overwintering larvae of the moth, and by *Pediculoides* sp., possibly *ventricosus*, Newp., which preys on the host larvae. In one infestation, 56 per cent. of the host larvae had been killed by the mite. There do not appear to be any climatic factors that would limit the effectiveness of *A. solitarius* where the host itself could survive. The fact that it overwinters in 2 forms and has several generations a year increases its effectiveness. It also appears able to produce a rather high percentage of parasitism and maintain itself when infestation by the host is not very intense.

HALL (R. C.). **Cape Cod Pitch Pine : its Resistance to Gypsy Moth Defoliation and its Advantages as a Forest Tree.**—*J. For.* **33** no. 2 pp. 169–172, 1 fig. Washington, D.C., February 1935.

The larvae of *Porthetria dispar*, L., cause severe damage on Cape Cod (Massachusetts) by defoliating forest trees. Many of the deciduous trees refoliate after the larvae have finished feeding, but large numbers of oaks are killed, and spraying to protect them is a constant expense. In 1932, it was observed that in various areas where heavy feeding had taken place, and where pitch pine [*Pinus rigida*] was associated with Scots pine [*P. sylvestris*], white pine [*P. strobus*], red pine [*P. resinosa*], European larch [*Larix decidua*], Norway spruce [*Picea abies*], or hardwoods, it was far more resistant to attack than the other conifers, with the possible exception of Scots pine. One complete defoliation may kill white pine. Larch was not completely defoliated, but most of the needles were severely injured. Of two plantations of red pines, one that was left unsprayed was practically destroyed. Pitch pines growing among these trees had been injured but not killed. The author did not observe actual feeding on pitch pine, but it is probable that no feeding occurs on the new needles protected in their long sheaths, so that the trees are only partly defoliated. On white and red pine and spruce, however, the larvae feed on both new and old growth.

The Nantucket tip moth [*Rhyacionia frustrana*, Comst.] attacks pitch pine, but since adventitious buds form beneath the damaged tips,

the trees lose only a few inches in growth. Although Scots pine is also resistant to *Porthetria*, pitch pine has decided advantages for botanical, forestry and climatic reasons.

STANILAND (L. N.) & BEAUMONT (A.). **Eleventh Annual Report of the Department of Plant Pathology for the Year ending September 30th, 1934.**—*Pamphl. Seale-Hayne agric. Coll.* no. 44, 59 pp., 3 figs. Newton Abbot, Devon [1935].

Pests that caused considerable damage in Devon and Cornwall during the year included: *Phorbia* (*Chortophila*) *brassicae*, Bch., *Psylliodes chrysocephala*, L., and *Meligethes aeneus*, F., on crucifers; *Kakothrips pisivorus*, Westw., on peas; *Aphis rumicis*, L., on beans and rhubarb; *Cydia pomonella*, L., which appears to be increasing on apple; *Dasyneura pyri*, Bch., on pear; *Tetranychus telarius*, L., which was exceptionally injurious on peaches grown under glass, and on strawberries, violets and polyanthus; *Lygus pabulinus*, L., on black currants; *Tarsonemus pallidus*, Banks (*fragariae*, Zimm.) on strawberries; and *Merodon* [*equestris*, F.], *Eumerus* spp., and *Tarsonemus approximatus* var. *narcissi*, Ewing, on narcissus. *Trialeurodes vaporariorum*, Westw., was very injurious to tomato and other greenhouse plants, but where its parasite, *Encarsia formosa*, Gah., was introduced good control was obtained. The species of *Phorbia* that tunnelled in young canes of loganberry in 1933 [*cf. R.A.E.*, A **22** 362, 427] was bred out and proved to be *P. rubivora*, Coq., which is a native species. Flea-beetles, which have been very injurious to mangels and turnips, were controlled by drilling flowers of sulphur with the seed. A list of the insects recorded as injuring crops in Devon and Cornwall during 1924–34 is given.

Among pests of anemones during 1934, wireworms (*Agriotes* spp.) in newly broken grassland can be reduced by growing a crop of mustard, which they do not attack, and ploughing it in green. Against the cutworms, *Euxoa* (*Agrotis*) *segetum*, Schiff., *Agrotis* (*Tryphaena*) *pronuba*, L., and *Feltia* (*Agrotis*) *exclamationis*, L., which were particularly harmful to anemones on newly broken grassland and on weedy land, a bait of 20 lb. bran and 1 lb. Paris green moistened with 1 gal. water containing ½ pt. molasses or treacle is the best means of control. The amount given is sufficient for an acre. The larvae of *Brotolomia* (*Phlogophora*) *meticulosa*, L., feed on the anemone flowers and render them unmarketable. The adults of the overwintered generation appear in May and June, and those of the summer generation in September. The larvae, which feed on various weeds and cultivated plants, may be found throughout the year, but are most common from July to September. The mature larvae spin a web on the ground or among stones on a rough wall and pupate. The flowers are damaged by larvae from eggs laid by moths that emerge in September. The first generation probably feeds on weeds. A spray of 5 lb. lead arsenate in 100 gals. water with an efficient spreader is recommended. Infestations of anemone by *Myzus ornatus*, Laing, resulted in deformed flowers. The Aphids are relatively scarce on the foliage, and there does not appear to be any period when they are all on the leaves before attacking the flowers. They probably migrate directly from other plants to the flowers. Dusting with nicotine sulphate is recommended to control *Smynthurus viridis*, L., which damages seedling anemones.

KEMPER (H.). **Die Pelz- und Textilschädlinge und ihre Bekämpfung.** [Pests of Furs and Textiles and their Control.]—*Kleintier und Pelztier* **11** no. 4–5 pp. 123–187, 31 figs., 5 pp. refs. Berlin, July 1935. Separate, price *RM.* 3·30.

This paper describes in a popular form the appearance, life-history, distribution and economic importance of insect pests of furs and textiles. The principal pests are *Tineola biselliella*, Hum., *Tinea pellionella*, L., *Trichophaga tapetzella*, L., and beetles of the genera *Dermestes*, *Attagenus* and *Anthrenus*. Less important pests include other moths and beetles, the silverfish, *Lepisma saccharina*, L., and *Thermobia domestica*, Pack., cockroaches, the cricket *Gryllulus* (*Gryllus*) *domesticus*, L., and Psocids. Preventive and remedial measures are described ; most of the latter are fumigants.

FUKUSHI (T.). **Multiplication of Virus in its Insect Vector.**—*Proc. imp. Acad. Japan* **11** no. 7, pp. 301–303, 2 refs. Tokyo, July 1935.

After showing that the virus of dwarf disease of rice in Japan can be transmitted through the eggs of the insect vector, *Nephotettix bipunctatus* (*apicalis*) *cincticeps*, Uhl. [*R.A.E.*, A **22** 59], the author carried out experiments to determine whether it was similarly transmitted to the third generation. A leafhopper bred from an infective female and paired with a non-infected male produced infections in 38 plants, and laid 35 eggs. Twenty-six nymphs from these eggs were transferred to healthy plants as soon as they hatched. Of these, the 15 that survived long enough infected the plants. Six of them were transferred daily to new healthy plants, and produced infections in 13, 55, 35, 11, 50 and 28 plants respectively. As the amount of virus originally contained in the body of a nymph must be extremely small, it seems necessary to assume that the virus multiplies within the insect. On any other hypothesis it is difficult to explain how one insect could infect 38 plants and distribute the virus into at least 15 eggs producing offspring that could infect 192 plants without again having access to a source of infection.

PAPERS NOTICED BY TITLE ONLY.

KANDA (S.). **Descriptions of new** *Pseudococcus* **(Coccidae) from Japan** [*P. flavidus*, *P. matsudoensis* and *P. sasae*]. [*In Japanese.*]—*Kontyû* **9** no. 2 pp. 83–90, 1 pl., 6 figs. Tokyo, July 1935.

KANDA (S.). **On the Genus** *Heliococcus* **(Coccidae)** [in Japan, including a new Species].—*Annot. zool. jap.* **15** no. 1 pp. 70–75, 1 pl., 4 figs. Tokyo, 15th June 1935.

CHEN (FONG-GE). **Methods for Collecting and Mounting Scale-insects.** [*In Chinese.*]—*Ent. & Phytopath.* **3** no. 19 pp. 378–383, 2 figs., 8 refs. Hangchow, 1st July 1935.

CHU (JOO-TSO) & HSIA (SHEN-HSIU). **A List of the Chekiang and Kiangsu Chalcids and Proctotrupids in the Bureau of Entomology, Hangchow** [with records of hosts].—*Ent. & Phytopath.* **3** no. 20 pp. 394–398. Hangchow, 11th July 1935.

Knowlton (G. F.). **Four Lupine Aphids** [*Aphis lupini*, Gillette & Palmer, *Macrosiphum albifrons*, Essig, and *M. zionensis* sp. n., from Utah, and *Aphis lupine-hansoni* sp. n. from Washington].—*Proc. ent. Soc. Wash.* **37** no. 5 pp. 112–115, 2 figs. Washington, D.C., 1935.

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Eidmann (H.). **Ueber die Morphologie der Legeröhre der Nonne** *Lymantria monacha* **L. (Lep. Lymantriidae).** [On the Morphology of the Ovipositor of *L. monacha*.]—*Zool. Anz.* **111** no. 3–4 pp. 104–108, 2 figs., 3 refs. Leipzig, 15th July 1935.

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